FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

No. 211. (No. 2, Vol. V.) | JANUARY 11, 1913. | [Registered at the G.P.O. as a Newspaper.] | [Weekly, Price 3d. Post Free, 3½d.

Flight.

Editorial Office: 44, ST. MARTIN'S LANE, LONDON, W.C.

Telegrams: Truditur, Westrand, London. Telephone: Gerrard 1828.

Annual Subscription Rates, Post Free.

United Kingdom ... 15s. 0d. Abroad ... ... 20s. 0d.

CONTENTS:

EDITORIAL COMMENT.

The Prevention of Accidents.

This week's issue of FLIGHT contains two articles that we believe most of our readers will find of considerable interest, the one from the pen of Mr. Griffith Brewer and the other by Mr. A. E. Berriman. We desire to draw particular attention to them for the reason that both deal with the question of safety in the air, which we are determined to do everything in our power to promote in the hope that the year 1913 may see some really marked advance in this direction.

At the same time, however, it is no part of our policy as a journal to take sides or to hold party opinion, our object being to facilitate the presentation of different points of view and to encourage their logical discussion. It is self-evident that there is no branch of the science of greater importance than this question of safety. Accidents continue to happen, and of late many of the accidents have resulted in death. Now, in the early days of flying it was a feature, on which we often remarked, that pilots seemed to bear charmed lives in their mishaps. The early days of flying constituted for those who participated therein a veritable chapter of accidents, but the number of deaths by comparison with the number of mishaps was few.

At the present day, the situation seems to be the reverse. Pilots of experience feel themselves familiar with the air. They have confidence in their machines, and they become ever more venturesome; but it does not appear that this suffices to account for the fatalities. From all accounts, there have been many serious accidents in which the pilot's death has been due, so to speak, to a trivial incident, but for which he might conceivably have escaped alive. The persistence of the fatal terminations, however, is none the less a fact, and in the face of that persistence of misfortune a more than ordinarily strenuous effort must be made to cope with the situation.

It is evident that it is the accident that must be avoided, since there can be no satisfactory remedy to the evil consequences thereof. Pilots do not take their machines up into the air with any thought of insecurity of tenure. Helmets and belts are worn by some and discarded by others as the fancy takes them; the thought of personal safety, it is evident in many cases, is not predominant, because the idea of catastrophe is foreign to the mind. Many pilots feel uncomfortable in a helmet which is enough to prevent them wearing it. Moreover, there is also the logical argument that any continual source of irritation is in itself a factor of danger as distracting the pilot's attention from his proper work.

Thus, we are led to the inevitable conclusion that accidents must not happen to machines while they are in the air. In general, accidents seem attributable to two causes, of which one is failure of materials and the other failure of control. The article by Mr. Griffith Brewer in this week's issue deals with an aspect of the former section, while that by Mr. Berriman presents a line of thought related to the latter.

Mr. Griffith Brewer's argument is directed towards the failure of wing spars, and it presents a point of view that is clearly worthy of investigation. His argument is that the local movement of the centre of pressure on the wings sets up torsional stresses in the wing which conceivably may have nodes of intensity inimical to the strength of the structure.

The possibility of the existence of such local torsional stresses in the wing structure of an aeroplane depends, obviously, on the system as such not tilting in harmony

with the travel of the C.P. That this is true of the modern aeroplane is self evident from the fact that the travel of the C.P. of the system as a whole is opposite to that of the wings in particular. From a broader standpoint, however, it would be equally true of any system lacking what, in Mr. Berriman's article, is referred to as sensitive longitudinal "weathercock" stability. Mr. Brewer's remarks, in fact, bear an interesting relationship to the article just mentioned, and more particularly so to a later part of that article not yet published, in which the significance of weathercock longitudinal stability is further explained. In the section of the article published in this issue, the aspect of the subject that is concerned with stability and control while steering is discussed as a problem apart, the hypothesis of weathercock longitudinal stability being assumed.

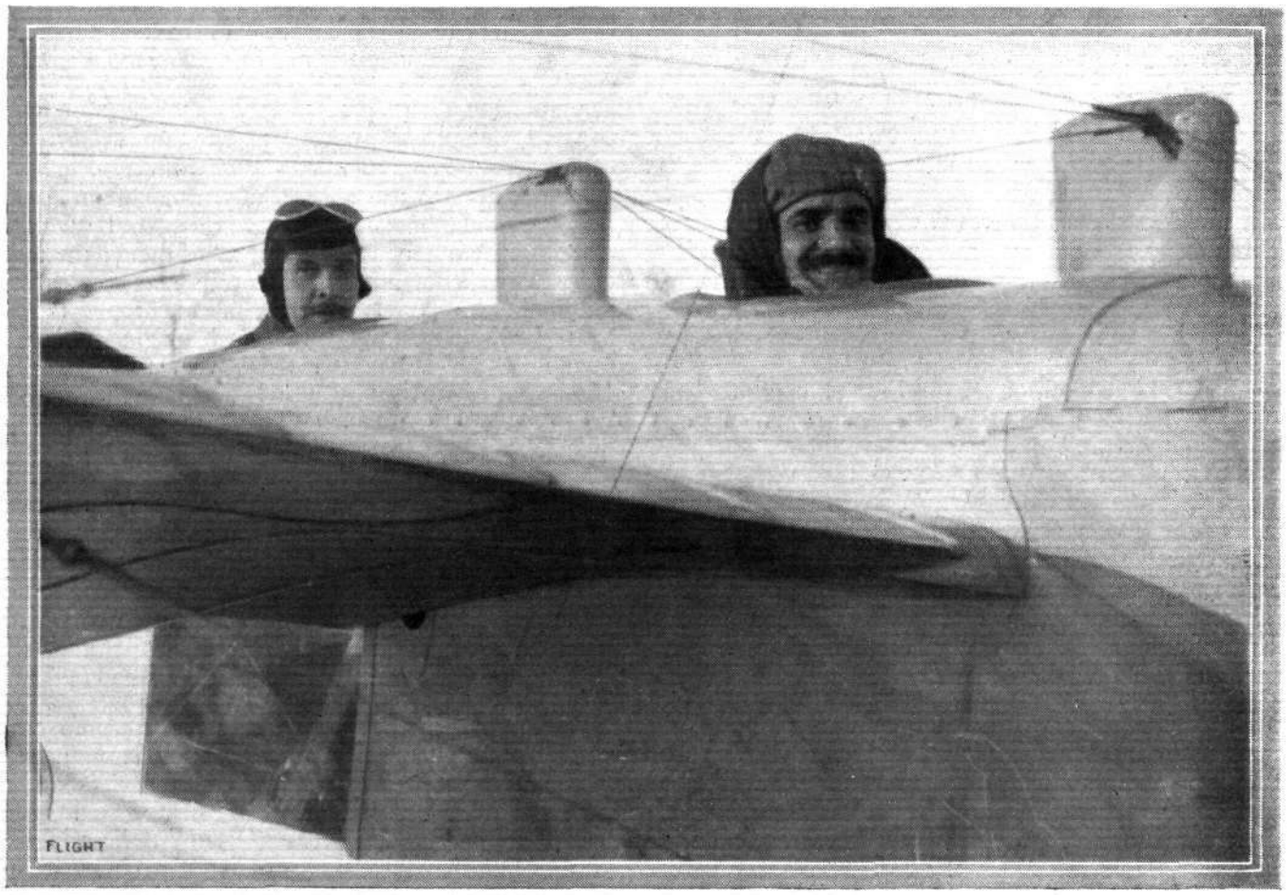
In that discussion, Mr. Berriman arrives at the conclusion that inherent lateral stability is to be sought in the use of *negative* wing-tips, emphasis being laid on the downward pressure of the wing-tips as distinct from a negative angle, which may still be accompanied by a positive lift for a few degrees below the horizontal. Such air-loaded tips will impose extra load on the machine in flight by virtue of their air pressure and to that extent would involve inefficiency, but if Mr. Berriman's conclusion as to their inherent security is accurate, then there is no doubt that this aspect of the subject also demands attention. As the Dunne aeroplane happens to be an example of a machine with permanently negative wing-tips, it may be as well to mention the fact here, although Mr. Berriman's article is related neither to that nor to any other machine in particular, being in itself an independent process of reasoning that has led to certain specific results, the nature of which was originally unsuspected.

One of the more interesting points in the article relates to the fundamental importance of the rudder as a means of controlling an unstable aeroplane: on a machine that is inherently stable Mr. Berriman concludes that a rudder would be useless. In this connection there is also a remark to the effect that an unstable aeroplane will not continue to steer a circular course with fixed controls. This is interesting, as it suggests a comparatively simple way of putting these things to the test, and any generously minded patron of flying who desired to identify himself more particularly with the encouragement of the safety aeroplane might, provided the logic of Mr. Berriman's argument is regarded as reasonably plausible by a competent committee, offer a prize for a circular course flown with fixed controls.

⊛ ⊛

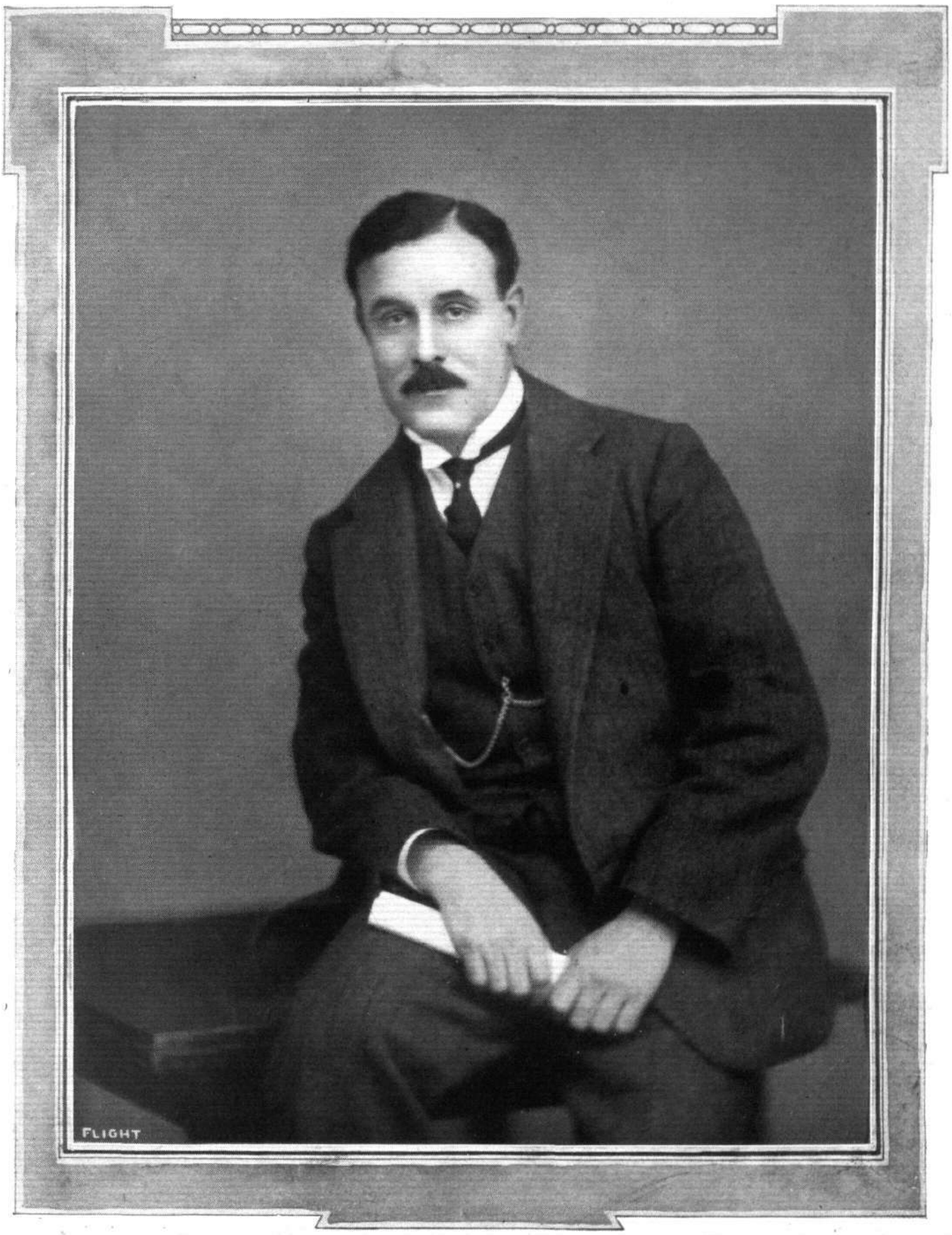
Death of M. Cailletet.

ALTHOUGH he was perhaps not widely known outside France, there is no doubt that the labours of M. Cailletet as President of the Aero Club of France have done a great deal to advance the cause not only in France, but all over the world. He joined the club in 1900, and a few years later he was asked to accept the office of President. Since then he has been re-elected every year, although several times he intimated his desire to retire. Quite recently he presided at a lecture at the club, at which M. Bienaime recounted his experiences in the last Gordon-Bennett balloon race. After the meeting he caught a chill, the effects of which he succumbed to on the 5th inst. at the age of 80. He was a noted scientist, and was elected a member of the Academy in 1884, and was made an officer of the Legion of Honour in 1889.



Capt. Bertram Dickson as passenger, with Mr. C. H. Pixton as pilot, about to set out for a flight on one of the 80-h.p. Bristol monoplanes at Turin during the tests by the Italian Government before taking over the Bristol monoplanes on order. This is the first aeroplane trip made by Capt. Dickson in Italy since his well-remembered accident at Milan when he had the terrible collision in the air with Thomas, another aviator.

MEN OF MOMENT IN THE WORLD OF FLIGHT.



HAROLD E. PERRIN, Secretary, Royal Aero Club of the United Kingdom.

"SOLDIER AND AVIATOR—A TRIBUTE."*

"WHAT a long time ago Easter Day, 1911, seems! That was the day my brother Patrick came home from India on leave. In a letter received from him just before, he wrote: 'I have a great scheme in my mind, and want you to help me.'"

These are the opening words of a little volume written by Miss Ethel Hamilton, sister of the late Capt. Patrick Hamilton, who was killed by the fall of his monoplane during the Army manœuvres in September last—a little volume in which the authoress reveals something of the inner feelings of one brother who met his end in the service of his King.

Every page of this simply-written memoir has a pathetic interest. It tells of the good nature of the brother, the courage of the soldier, and the enthusiasm of the aviator. And it touches the heart all the more when, in her closing words, Miss Hamilton gives the names of her brothers, "who counted not their lives dear unto themselves," but gave them at the call of King and country. They were:—

Alastair, Royal Irish Fusiliers
Kenneth, Ceylon Contingent } Killed in South Africa.
Ernest, Bethune Mounted Infantry
Patrick, Royal Flying Corps. Killed on manœuvres.

The "great scheme" her brother Patrick had in his mind, Miss Hamilton goes on to tell, was that he would learn to fly. At first he was persuaded not to, but his mind was made up, and nothing would deter him. Yes, there was one thing that would have influenced him. Had his mother asked—but that was not her way, for "she said that no one's personal feelings ought ever to interfere with any man's career provided it was an upright and honourable one to follow." Was not the mother as courageous as the aviator in thus expressing her opinion?

Readers will remember the late Capt. Hamilton learning to fly, how he met Mr. G. M. Dyott, and how they decided to go over to America to fly, taking with them two Deperdussin monoplanes, a 60-h.p. two-seater, and a little 28-h.p. single. During his tuition he had the misfortune to hurt his knee, and it was hardly well again when the time arrived for him to sail.

Recalling his departure in the boat-special from King's Cross, Miss Hamilton writes: "It wrung my heart to see him, such a slight, solitary figure he looked on his two sticks, being pushed and hustled by a noisy American crowd; but even there I saw him help some woman with her parcels,"—a little incident which beautifully illustrates the kindly trait in his character.

Some few months after his arrival, it will be remembered, he had an accident while flying in Mexico, which might easily have cost him his life, for on the little single-seater he was caught in an eddy which turned him completely over and brought him down 100 ft. heavily to the ground. Writing to his sister after the accident he said: "Don't be alarmed, as I have not so much as a scratch, but I have had about the limit in smashes." He went on to describe the details that led up to the fall. Later he resumed: "The propeller was not even good for matchwood, the tip of the skids went like paper. One wing is as good as a sick headache and the other we can repair. When we struck my legs were caught in the bridge (the control bridge) and luckily kept me there, and I watched the oil and petrol pouring out of the tank, and wondered if it was going to fire, but nothing happened, and by the time I realised I was not in another world, I crawled out and started looking over the wreck. Then I began to realise I'd had about the most wonderful escape anyone could possibly have."

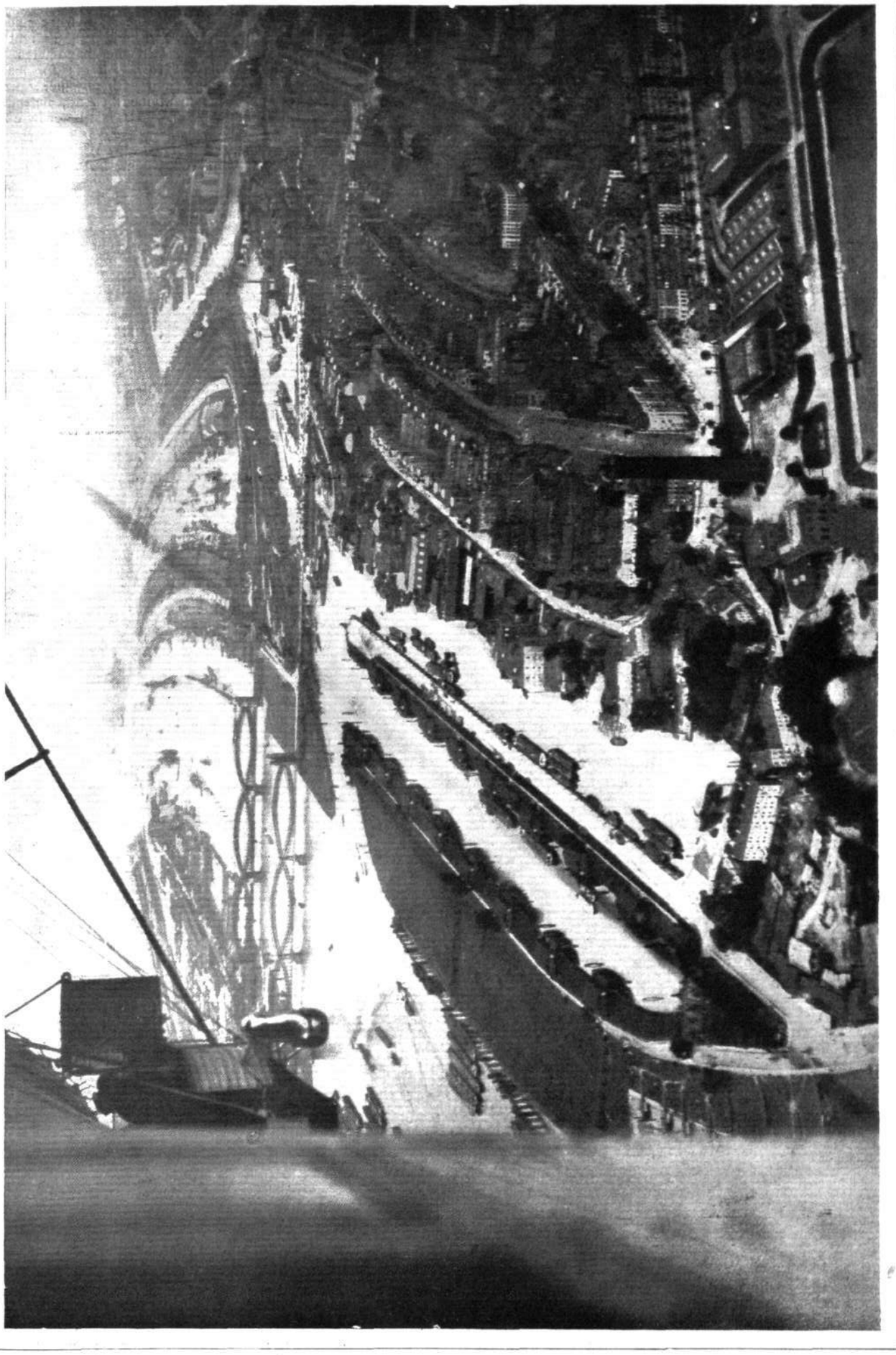
His only fear was that, following on such an accident, he might be afraid. Anyone who has personal acquaintance with a pilot will readily understand this. But he found himself not afraid. All the time he seemed to realise the importance of military aviation in a serious way, thinking it necessary strength for our nation. He said "It has *got* to come, and we have *got* to do it."

For his keenness, it is but necessary to recall a remark he once made. "If I have to go absolutely broke," he said, "I am going to take out a machine to India."

Returning to London from America, an article in the *Daily Mail*

* Publishers: C. W. Daniel, Ltd., 3, Amen Corner, E.C.

THE RESULT OF FLYING AFTER SUNSET AT MEXICO CITY.—The machine turned completely over and *vol planéd* down on its back. Everything was smashed except the wheels and the pilot—the unfortunate Capt. Patrick Hamilton, who met his death not long since during the Army manœuvres.



The upper reaches of Hamburg Harbour, as seen from the Zeppelin dirigible, "Hansa."—*Berlin Motor.*

attracted his notice, and caused him to reconsider his decision to go to India. He would be more use, he thought, in England with his machine. And eventually he was able to get the necessary permission from the Foreign Office to stay in England.

It is a curious point that right up to this time the late Capt. Hamilton had not taken his certificate. He immediately set out to obtain it, and passed for his credentials on March 16th.

The story goes on to tell how he had his machine, which was at Southampton, overhauled and reinforced; how eventually he obtained his flying orders from the War Office and how he flew over to South Farnborough from the Beaulieu aerodrome, to which flying ground he had had his monoplane taken. This was the same machine—a 60-h.p. Deperdussin—that he used for so long at Lark Hill, Salisbury Plain. He took his superior *brevet* on July 13th, being the sixth to qualify.

"On the 13th August my brother came home for the last time." . . .

"It was during this visit that I asked him if he was at all afraid of death. He seemed quite surprised and replied 'Why should I be?' It made me feel almost ashamed of having asked. Indeed why should he be? There was no reason that could possibly cause him to fear. We little thought death was so near. I asked him what he thought came after this life, and he said he had no idea, except he was sure it was something better. And now he knows! He had such a wonderfully beautiful mind."

"Pat left us on 18th August with a light heart, perfect confidence, and no fear. His joy was in his duty, and he hoped he might help to demonstrate the use of aeroplanes in the manœuvres. He laughingly remarked the last day, 'Now look out for machine No. 158, because that will be mine, and with any luck, perhaps even the King may hear my name mentioned.' And, indeed, this came true in a way we little thought of." His last letter here ran:

"My dear Ethel.

"Many thanks for yours. I am off to Wallingford about 5.30 a.m. (September 3rd). The 100 Gnome-Dep. is going very strong. She is a wonderful machine, climbs like a rocket. Yours in haste. Love to all,

"PAT."

The machine he referred to was the one that Prévost had successfully flown in the Military Trials. Four days later, Capt. Hamilton and his passenger Lieut. Wyness-Stuart were killed on that machine, falling from 1,500 ft. near Graveley. For the machine on which he learnt to fly he had previously mentioned in a letter—

". . . I hope never to fly any other machine except a Deperdussin. They are absolutely marvellous."

He never did fly any other machine. He met his end on that machine. But it was not the machine's fault, nor yet his own.

So he went to his rest—a soldier and a man of whom we were always proud. And we are prouder still now we have read the little memoir his sister has given us.

"20,000 KILOMETRES IM LUFTMEER."

HELLMUTH HIRTH, the well-known German aviator, and winner of numerous flying competitions in the Fatherland, has recorded his experiences in the air in a book bearing the above title, which has just been published by Gustav Braunbeck g. m. b. H. Berlin W. 35. After an introductory autobiography, and a highly-interesting chapter of experiences as a pupil, and later as an instructor, in the art of flying, in the following eight chapters the author describes all the more important German flying events of the past two years in which he took a prominent part, and often proved to be the winner. Mr. Hirth has the rare gift of describing highly technical points in a very popular manner and in a language that is easily understood by anyone totally unacquainted with the subject. In the chapters which deal with what we should call the "adventures," the author proves himself a *reconteur* of no mean order. He tells his story in a sporting and a free-and-easy way, just as if he were telling it to a number of friends gathered around the fireside.

Many and various are his stories, but each one holds you spellbound from start to finish. Not the least interesting point about Hirth's career is the fact, stated at the end of the first chapter, that it was in England that he first heard of actual details of flying, and while at Leicester he read of the first experiments of Santos Dumont, Farman and the Wright Brothers.

Although written in German, the style of the book is so easy and plain that even those with only a superficial knowledge of the language should be able to read and enjoy it. A large number of photographic illustrations handled in a delightful manner, and a diagram of Hirth's machine—a Rumpler Taube monoplane—considerably increase the reader's interest in the work. The price of the book is 5 marks.

Washed up by the Sea.

AN echo of the sad catastrophe to Mr. Cecil Grace in December, 1910, is afforded by the news that a petrol tank, which is believed to have belonged to the machine he was flying, has been washed ashore at Ostend.

THE ITALIAN GOVERNMENT ORDER FOR BRITISH AEROPLANES.—One of the 80-h.p. Bristol monoplanes on the Mirafiori ground at Turin. On the extreme left is Mr. White Smith, Secretary of the British and Colonial Aeroplane Co., Ltd.; next to him, with muffler on, is the Chief of the Aviation Department in Milan; Pixton is just getting into the pilot's seat, and one of the Bristol mechanics is standing by the propeller.

THE COLLAPSE OF MONOPLANE WINGS.

By GRIFFITH BREWER.

ABOUT a year ago, M. Blériot, with his characteristic courage, reported to the French Government that monoplanes were liable to collapse in the air, not by the breaking of the stays under the wings, but by the breaking of the supports over the wings. Until then the upper stays were regarded as simply performing the office of holding up the wings when the machine was not in use, and it was not until M. Blériot pointed out that these supports could be brought under flying strains, due to pressure being received on the upper surface when a machine is directed downward too suddenly, that makers of monoplanes recognized the necessity of strengthening the upper supports.

In spite of this strengthening, however, accidents in which the wings break downwards continue to occur, and it therefore becomes vitally necessary either to abandon the use of monoplanes altogether, or to look more deeply in order to ascertain the cause of this type of structural collapse.

The suggestion that I wish to put forward is, that a monoplane may be flying in a straight path, and suddenly, without any change in the angle of flight of the machine, the pressure may be caused to leave the lower surface and come on to the upper surface, and this with a momentum which imparts a sudden strain to the upper wing supports greater than the strain usually carried by the lower stays.

The wings of monoplanes project like arms from the sides of the *fuselage*, and it is therefore obvious that it is easier to twist the outer ends of the wings than it would be to twist the shoulder portions which are attached to the *fuselage*. In fact, the greater the span, the more readily will the wing tips be twisted when subject to twisting strains.

It is more than ten years since the Wright Brothers' experiments at Kitty Hawk, as described by Wilbur Wright in the *Automotor Journal* at that time, showed that the centre of pressure below a plane moving through the air at small flying angles, travelled backwards as the angle of incidence decreased and as the speed of the plane increased.

What, therefore, is the effect of change of speed on the wings of a monoplane?

Without changing the path of flight of the machine, the speed of travel may increase, and this causes the centre of pressure to travel backwards thus tending to turn the wings over forwards, owing to the pressure below the front portion decreasing whilst the pressure increases below the rear portion. The effect of this change in the centre of pressure, is a progressive twist from the shoulders of the wings outwards, the left wing twisting like a right-hand corkscrew and the right wing twisting like a left-hand corkscrew. The amount of twist is of course very small and is probably not perceptible to the eye, but with continual changes in the speed of the machine this twisting effect is continually taking place.

This twisting of the wings does not have the effect of changing the pressure from the lower surface to the upper surface until the critical angle is passed, and then the ends of the wings flip over, taking up the slack suddenly.

Let us picture an example of what may take place.

A monoplane is coming down from a height with the engine cut off. Before reaching the ground, the pilot restarts the engine and thus increases his speed of flight, causing the centre of pressure to travel backwards under the wings and tend to turn the machine downwards. The machine, however, aided by the gyroscopic action of the rotary engine, resists being diverted suddenly downwards, and the wings, therefore, bend or twist forward as the pressure decreases under the leading portion and increases under the rear portion. If the change of speed is such as to merely change the position of the centre of pressure without twisting the wings sufficiently to bring the pressure on the upper portions of the tips of the wings, then the use of the elevator corrects the flying angle. If, however, the wings are twisted to such an angle as to bring pressure on the upper portions of the wing tips sufficient to exceed the support below the wings, a quick downward angular movement of the ends of the wings takes place, and the upper stays then receive the strain of the slack being suddenly taken up, in addition to the pressure received from the downward inclination of the ends of the wings. Probably the whip over in the change of direction of the strain does the actual breaking, and the wings then presented to the air at a downward inclination are slammed down by the wind like suddenly released doors.

If this theory is correct, it is not only when starting an engine that this danger occurs. On a windy day, a machine continually runs into whirls, which have the effect of altering the speed of the machine through the air, and also of altering the angle of incidence. The centre of pressure is thus continually moving backwards and forwards beneath the wings, which twist in proportion to the length of their span and the slackness of the stays, and so they are continually approaching towards and retiring from the critical angle, where, if reached, they would whip over to a negative angle.

Change in direction of air gusts, and speed of machine in flight must both have considerable bearing on this question, and when it is remembered that a change of less than 5° in the angle of the wing tips is often sufficient to reverse the direction of pressure on the wings, it will be recognised how close to the safety margin many monoplanes continually fly. The truss systems of the biplane structures make the wings equally strong in both directions, and so this collapse danger is entirely absent.

In all cases a rotary engine would appear to increase the danger, because the wings in twisting find themselves opposed by a more unyielding base than would be the case with an engine having no gyroscopic effect.

I should have liked to have followed up this diagnosis with a curative prescription, but it will perhaps be best to leave my readers to criticise the theory before carrying it any further.

N.P.L. Exhibit at Ghent.

IN the British Section at the Ghent International Exhibition the National Physical Laboratory will have an exhibit illustrating the experimental investigation into the science of flight carried on at the Laboratory. There will be large scale models of wind channels and also of the special tank which permits of photographs being taken of the actual currents and eddies which play about and round the wings and framework of an aeroplane.

SOME THOUGHTS ON STABILITY AND CONTROL.

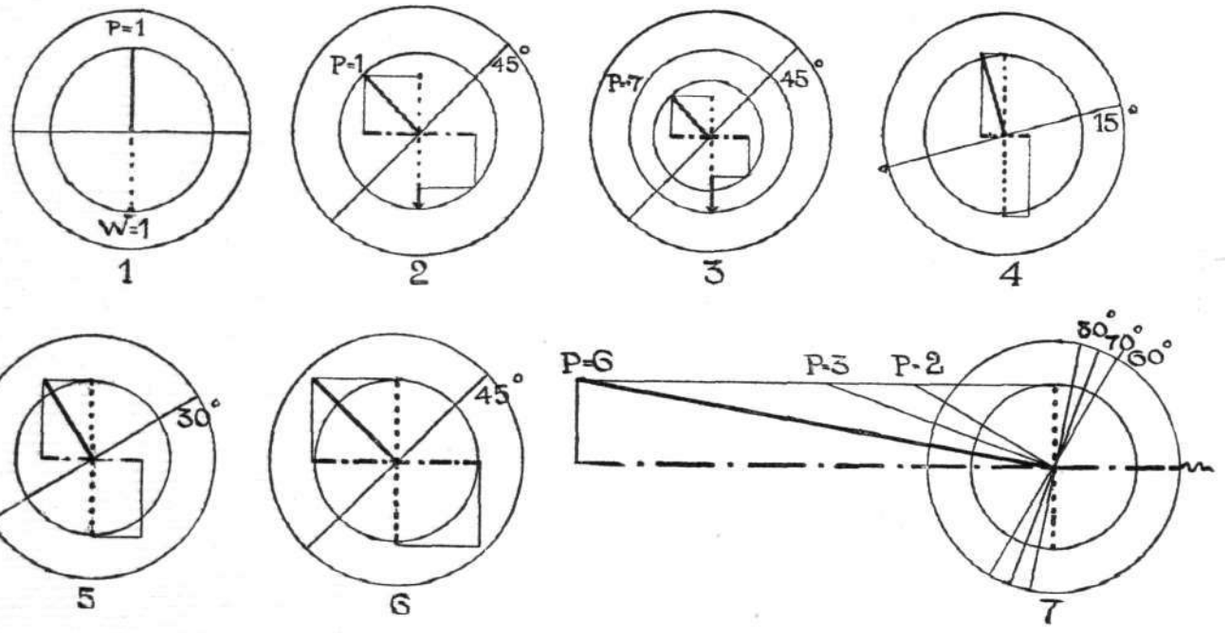
By A. E. BERRIMAN.

I. The Influence of Negative (Down Pressure) Wing Tips on Steering and Balance. Instability and the Rudder.

THERE arrives a time when one's thinking machinery tends to describe circles about a problem that has much exercised the mind. It is then that one may usefully appeal to others for the assistance of parallel lines of thought. What follows is, therefore, put forward as a basis for discussion and criticism; it is purposely presented as a personal article in order to avoid any possible misconception as to its being, in any sense of the term, a settled opinion of FLIGHT.

Of all problems of aviation, none exercises a greater fascination than that hidden behind the term "stability"—and the definition of the very word itself is not the least of many difficulties. Besides the natural attraction of an elusive subject, however, all who are in any way closely associated with the world of flying feel an insistent necessity to keep on thinking and pondering over the matter, because they realise how many accidents might conceivably be avoided if only the subject at large were better understood.

But for that thought, one might well rest content to await the arrival of carefully compiled laboratory data, preferring to digest facts at leisure rather than to try to force the mind into the dark places without a light. It is, in any case, surely essential that no effort should be spared to ensure the year 1913 being productive of some appreciable progress towards the solution of the stability question; if the following thoughts only supply crude material by the destruction of which the general outlook may be made clearer, they will have served their purpose well.



In order to elucidate one's meaning, it is often desirable to use definite statements as if conjecture were indeed fact; where the following expressions may appear to be dogmatic, therefore, it is solely with this aim in view. It seems necessary to mention this, as some of the temporary conclusions affect the design and use of aeroplanes, and the last thing that I should wish is to appear to be attempting to tell manufacturers and pilots their own business.

Having removed that source of possible misunderstanding, the least confusing procedure will be to sum up a few of the temporary conclusions in advance, in order that those thus far interested may know whether it is worth their while to read further.

The line of thought that I have followed leads me to believe that some real measure of inherent lateral stability in the absolute sense might be derived from the use of permanently *negative** (down pressure) wing tips.

By inherent lateral stability in the absolute sense I mean that the wing spars will not cant at all unless the pilot destroys their balance by a movement of the control.

In order that this stability may be fully realised, it is necessary that the machine should also possess *sensitive* longitudinal stability of what I call for the sake of distinction, the "weathercock" order.

By "weathercock" longitudinal stability I mean that the wings tilt and dip in sympathy with the trend of the wind in the vertical plane. In short, a machine that has sensitive weathercock longitudinal stability maintains a constant angle of incidence to the relative wind.

Possessed of these qualities, it appears to me conceivable that such an aircraft should be incapable of sideslip or of making a *vol piqué*, provided that the controls are not such as enable the pilot to neutralise the inherent properties of the design.

On such a machine a rudder would have no power to steer a course, consequently it would not be present. Steering would be effected by warping the negative tips, the inside wing having its negative angle increased. The aircraft would follow a circular course depending on the warp, and would not tend to turn inwards too quickly of its own accord.

As all manœuvres involve the expenditure of increased power if they are to be carried out on the same level, the machine would descend while turning unless the power output from the engine were increased sufficiently to cope with the load due to the centrifugal force as well as the weight.

It is difficult to select an appropriate starting point from which to begin upon a review of the subject, because, although it is certainly necessary to deal in writing with one point at a time, the problem does not lend itself readily to such sub-division. Indeed, it is because it is necessary to hold so many different phases of it simultaneously in the mind, that the whole line of thought is apt to become confused by much thinking.

Longitudinal, lateral and directional stability are all intimately related, and seem to me to be largely dependent on one another. It is, I believe, generally supposed that longitudinal stability is a comparatively simple problem, but, personally, I must confess to finding some aspects of it not less difficult to grasp than those relating to lateral stability.

Whatever may be the most difficult point of all, I think it will generally be conceded that the problem of stability while turning is as important as any, and there are some advantages in originating discussion at this point. It can hardly be said to be the simplest case, but that, I think, is an advantage, inasmuch as it draws attention to several vital considerations in the first instance that might otherwise be ignored.

It is a self-evident fact that aeroplanes have to be built so that they can be steered, and it is hardly less obvious that the greater part of the time that aeroplanes are in the air they are pursuing a curved course. But, apart from the question of voluntary steering is the fact that if canted, the aeroplane will begin to steer of its own accord.

These and other considerations render it very clear that no proposed solution of the problem can ever be regarded as adequate if it does not cover the conditions of steering. Equally it is

* In the use of the term negative it must be quite clear that it is not merely a negative angle of incidence that is implied. Cambered wing sections continue to exert a positive upward lift even when the angle of incidence of the chord to the line of flight is slightly negative. A wing may thus have a negative tip without having a downward pressure on that tip. In the above use of the term negative, the existence of a downward pressure on the wing tip is implied.

apparent, for the same reasons, that any improvement in the safety of this manœuvre would be of the very greatest service to the progress of flying, especially at the present time.

One advantage of discussing at once the subject of stability on a curved course is that it brings to the fore the primary essentials required for initiating and maintaining the machine in its turning circle.

It is essential to realise that the c.g. of any system such as is, in this case, represented by an aeroplane, will not change its straight line course unless a force be applied from without directly upon the c.g., and along the path in which the c.g. is required to accelerate.

A particle moving in a circle is accelerating towards the centre, and the acceleration is constant when the velocity of the particle on the periphery is uniform. The acceleration increases with an increase of velocity and also with a decrease in radius.

From the fact that the acceleration is along a radius, it is evident that the initial direction of the steering force should originate at right-angles to the straight line path formerly pursued by the aeroplane. This at once draws attention to the potential advantage of banking the wings in order to initiate a steering movement, for the pressure on the wings remains at right-angles to the wing spars, and when canted it thus automatically provides a centripetal component.

A rudder, as ordinarily understood, is not, it seems to me, fundamentally necessary for steering if the wings can be banked *properly* by other means.

Consider for a moment the accompanying diagrams which are supposed to represent the forces as seen in an end on view of an approaching aeroplane. Fig. 1 shows the lift, P, equal to the weight, W, the wings being level. In Fig. 2 the wings are canted to 45°. As the pressure remains at right angles to the wing spar, its direction is tilted in sympathy with the bank. Assuming the relative air speed to be unchanged, the magnitude of the pressure will be the same as before. In its new direction it is unable to support the entire load of the weight, a fraction of which thus initiates downward acceleration.

But, there is now a horizontal component of the pressure causing acceleration to the left (supposing the machine to be advancing out of the plane of the paper towards the spectator) and this centripetal force is opposed by the equal centrifugal force as the machine proceeds along its appropriate circular path.

For the particular speed, there is a particular radius that will provide the proper centrifugal force to balance the centripetal force due to the bank, and the circular path corresponding to this radius the machine automatically pursues *without any aid from the rudder.*

While the bank, represented in Fig. 2, is being established, the radius of the turning circle is diminishing, when the bank is fixed, the centre of the turning circle is also fixed. The conditions of Fig. 2 may thus represent the beginning of the turn, or any instantaneous position during the turn.

It will be understood, therefore, that Fig. 2 represents a state of turning on a circular path, accompanied by an accelerated descent due to the weight being insufficiently supported. This latter is, of course, a possible source of danger at low altitudes when the ground may intervene to prevent the proper completion of the turn. If the lift should be reduced for any reason, the unsupported fraction of the weight is increased at the same time that the radius of turning increases, as shown in Fig. 3.

In order to turn on the same level, it is necessary to increase the speed, which means increasing the power output. Reserve power is thus a primary "factor of safety" for turning.

In Fig. 4 is shown the case of a 15° bank, and increased speed giving sufficient wing pressure to support the load and maintain a rather wide turning circle. In Fig. 5 the increase in the wing pressure needed to support a 30° bank is indicated, and in Fig. 6 the bank is again 45°, as in Figs. 2 and 3. The pressure, it will be observed, is nearly one-third greater than normal. If $P \propto V^2$, then the velocity required represents an increase of about 15 per cent.

Beyond the angle of 45° the wing pressure needed to support the load plus the centrifugal force increases very rapidly as is shown in Fig. 7. For a bank of 60° the wing pressure is about twice the normal, for 70° it is about three times the normal, and for 80° it is about six times the normal value; the corresponding increments in speed are about 1·4, 1·74, and 2·45 times the normal velocity.

From the limited reserve power of modern engines, it is apparent that steep banks must, of necessity, be accompanied by rapid descents while turning. It is necessary to emphasize that extra *power* must be provided because the angle of incidence remains constant under longitudinal weathercock stability. Variable speed by variable resistance accompanied by variable angle of incidence will not meet the conditions of the diagrams. The energy of a steep dive during which abnormally high velocity has been acquired under gravitational acceleration may suffice for, although it certainly does not warrant, the manœuvre.

From the above considerations it is apparent that it is dangerous for the bank to tend to increase of its own accord while turning; it remains, therefore, to consider the tendencies in this direction. This phase of the problem is evidently related to the organs of control, and before entering into a discussion thereon, it is helpful to fix in the mind a picture of an aeroplane flying along a circular course.

As an artifice to this end, it is convenient, I find, to imagine that the machine is swinging around a sort of maypole and to place oneself mentally at the top thereof. In order to complete the picture, imagine oneself to be holding a fine thread leading straight down to the button on the top of the pilot's cap. The idea of a thread lends emphasis to the fact that it does not help to support the weight of the machine, while at the same time it assists in mentally fixing the desired conditions. The thread is in line with the wing pressure, P, of the diagram. Thus, the steeper the bank the lower is the height of the maypole on which one is sitting. For a bank of 90°, one would be on the same level as the pilot; for no bank at all, the height of the pole would be infinite.

It is also self evident from the mental picture that the inside wing tip might be attached by another imaginary thread to a point lower down the pole. As the aeroplane pursues its circular course, these threads, which may be supposed attached at their lower ends to rings, maintain an angular velocity about the pole, and the spectator, who may be supposed to be on a revolving chair, looks down always on the same perfect plan view of the machine.

The conditions that have established the spectator's position are the speed and the initial bank, both under the pilot's control. Assuming, therefore, that the pilot temporarily fixes his controls in those positions, the c.g. of the aeroplane should continue its circular course unchanged, and we may say, therefore, that anything tending to stretch or slacken our imaginary threads is a sign of the instability in the system.

It is apparent, by the way of a preliminary investigation, that such disturbances may be due either to an alteration in the angle of bank which will affect both threads, or to the machine beginning to spin about its own vertical axis, which will twist the upper thread and stretch the lower.

Let us ascertain, therefore, what occurs when either of these things happens, so that we may be better in a position to realise what qualities are required of a stabilising system that is intended to prevent the disturbance.

Firstly, however, let us be clear as to what peculiarities, if any, distinguish a *proper* circular flight. One thing at least will be apparent to our spectator on the top of the maypole, namely, that the inner wing is travelling through the air at a lower speed than the outer wing.

Notwithstanding its lower speed, it is evidently supporting its proper share of the load, otherwise there would be an unbalanced couple about the longitudinal axis tending to increase or diminish the bank.

Again, from the fact that there is no spin about the vertical axis of the machine, it is apparent that there is no unbalanced torque due to the relative resistances of the two wings at their respective speeds.

When an aeroplane is flying on a straight line course, its balance is procured by similar considerations, namely, each wing lifts its share of the load, and each wing experiences the same resistance at the same speed while so doing, and thereby avoids any tendency to create a spin about the vertical axis.

Knowing that the two wings are geometrically similar in respect to effective angle when flying on a straight course, it may reasonably be argued that they must be dissimilar in this respect while flying a curved course, unless it can be shown that a proportionately heavier load on the outer wing due to the curvature of the path and the bank.

The equivalent of such a load might be provided by the centrifugal couple, but it requires to be investigated whether this couple varies with the conditions in such a way as to preserve the balance.

If a stick has a string attached to the centre of its length and is whirled at the end of the string, it has two positions of equilibrium, only one of which is stable. The position of unstable equilibrium is when this stick is perpendicular to the string; if tilted, the increased radius of the outer half of the stick now produces an increased velocity, and therefore an increased centrifugal force, which, being cumulative, causes the tilt to increase until the stick lies in line with the string. It is then in stable equilibrium.

This centrifugal couple must, it seems to me, be an important factor in the stability of an aeroplane while flying on a curved course owing to the span and weight of the wings.

Also, it is present as a disturbing influence on the tail owing to the overall length of the machine. This latter may cause pilots to feel the necessity of ruddering *outwards* while turning inwards, in order to prevent the machine turning inwards too much of its own accord.

The centrifugal couple on the tail of modern aeroplanes would

also make it more difficult to analyse the disturbing forces on the wings while flying.

In as much as a centrifugal couple of some magnitude is certainly in operation against the bank, it is apparent that there must be an equal pressure couple opposing it, if the balance and the bank of the machine are both to be maintained. Evidently then, if the wings are warped, their relative angles must not entirely neutralise the difference in the relative velocities of the wings.

Apart from other considerations, therefore, it seems to me as if the conditions of lateral balance on a *banked* turn could not be satisfied by a helical warp of the kind that simultaneously increases the angle of the inner wing in proportion to the decrease of the outer wing.

Such warping might be made to satisfy the requirements of a turn made on level rings, but this manœuvre supposes the machine to be fitted with a vertical fin about the c.g., which it is the object of banking to avoid by the use of the projected area of the canted wings.

In short, it would seem desirable to be able to warp each wing *independently*.

Ruddering outwards, it has been shown above, may be necessary while turning, in order to counteract the centrifugal couple of the tail; so long as that force is balanced, the warp may be considered as a unit apart.

Clearly, the wings will always tend to divide the engine power equally between them. If the resistance of one wing is less than that of the other, the wing having the lesser resistance will accelerate, and *vice versa* until the balance is established.

While flying on a circular course, a difference of velocities is essential; consequently the resistance of the outer wing must be *less* than the inner wing.

If the wings have similar angles, the resistance of the faster wing will certainly exceed that of the inner wing, consequently a turn with unwarped wings will not continue.

If, however, angular momentum is generated about the vertical axis by a preliminary spin, engendered by ruddering inwards in order to increase a turn, then a curved path with banked but unwarped wings may continue while the energy lasts.

If the wings are independently warped, then, from previous considerations, it is apparent that the resistance of the lower wing must be proportionally greater for the load supported than is the resistance of the upper wing.

From experimental evidence, it is well known that the aerodynamic efficiency of a cambered wing varies with the angle of incidence, and this suggests that a pair of independently warped wings might satisfy the conditions of equilibrium while turning. The inner wing would, of course, have the greater angle of incidence. It remains to be seen how far they might tend to confer the stability on the system.

If a positive lift wing is warped so as to increase the angle, the momentary reaction is obliquely upwards and backwards, being in part added resistance and in part added lift. Of these components the former tends to reduce the velocity in a sense appropriate to the conditions of turning with the warped wing inwards, but the latter tends to cant the wings the wrong way.

Conversely, if the other positive wing is warped to reduce the angle, its resistance and its lift are momentarily decreased. On the one part, therefore, it tends to accelerate and on the other part to descend. A tendency simultaneously to accelerate and to ascend is, however, what is required of the outer wing when initiating a turn.

Clearly, therefore, warping by itself is an unsatisfactory method of steering an ordinary aeroplane, and seems a dangerous operation rather than otherwise.

As the cant introduces a steering force quite irrespective of whether it is or is not accompanied by a spin, it is the cant that governs the situation. It is, therefore, apparent that the rudder must be used *against* the warp resistance when initiating a turn. The machine will then steer in sympathy with the initial rudder movement, and the wing with the greater angle will ascend.

But so soon as the bank appropriate to the desired turn has been established the machine enters upon its curved course and the warp must immediately be reversed, because the relative angles of the wings are opposite to the real requirements.

Further consideration of this matter shows, moreover, that the manœuvre calls for precision and skill, if danger from overbanking is to be avoided.

While rising, a positive angle of incidence is virtually diminished. Opposed by the rudder in its line of retreat, it is thus evident that the line of least resistance for the warped wing with the greater angles, which is rising, is to rise still more.

The balance of power will not support its superior angle, and the only way in which the angle can become less under the circumstances is by continued ascent.

In fine, warped positive wing tips appear to me to be inherently unstable.

From the foregoing considerations, however, it is clear that the inner wing should be warped to a greater angle while turning, in order to provide the increase in the resistance requisite to the maintenance of a circular course. But it has just been shown above that the warp itself works the wrong way for initiating a turn, consequently nothing is left for the pilot but to "fish about," as it were, after banking until he finds a warp suitable for maintaining the turn.

Unsatisfactory at its best, the procedure is evidently also fraught with considerable risk. If the warp of the inner wing is made excessive, its oblique pressure will, as usual, have two components, one tending to lift the wing the other tending to make it retreat. If the wing rises the other wing must descend, which would virtually increase its angle and its load. If not opposed by the rudder, the line of least resistance, it appears to me, is one of retreat, for the outer wing will be very willing to decrease its angle by ascending in sympathy with the spin.

If this happens, the bank and the spin are increased simultaneously, and the turn culminates in a spiral nose dive or side slip according as to whether the bank or the spin predominates.

If the preceding remarks are logical, sufficient has been said to show that the warping of positive wing tips is no aid to practical stability while turning, whatever advantage they may have as a means of restoring lateral balance after a disturbance on a straight line flight.

Wherever the warp is used, it is essential to be ready with the rudder, and one way and another this organ assumes a position of vital importance to the safe control of the modern machine.

More may have to be said later, and of a less favourable character, as to its significance when regarded as a neutral fin.

For the time being I will endeavour to advance the argument on the problem of turning, by drawing especial attention to that fundamental aspect of the case for which I have used the expression "balance of power."

From what has been said, it seems evident that a stability analogous in principle to the stability of a table on the floor is required to satisfy the conditions.

A table is stable, because, when it is tilted, the c.g. of the system is raised. In short, because work is done on the system.

If a wing were unable to move either way from its relative position without doing work on the system, it would be stable. Symmetrical positive wing tips would be stable if they could not spin about the vertical axis, for if one wing ascends it decreases its virtual angle, and if the other descends in harmony it increases its virtual angle.

The different relative angles represent different relative resistances, and therefore tend to produce different relative speeds: in short they tend to initiate a spin. If a spin is impossible, they tend to destroy the balance of power, which is stable. If, when one wing rises, the other does not descend, the c.g. of the system is raised, which is also stable.

To the above I mainly attribute the natural lateral steadiness of a modern aeroplane in the hands of the average pilot. In principle it seems to me analogous to the steadying effect of the keel of a yacht. Normally neutral, the keel assumes an angle of incidence *while* the boat rolls under a puff of wind on the sail.

The spin of an aeroplane is ordinarily resisted by the rudder, and the rudder is thus the chief organ controlling the equilibrium of the modern machine. But the wind may spin relatively to the machine by veering or backing. To still be stable, the rudder must automatically spin the machine in sympathy with the wind; *i.e.*, there must be sensitive directional weathercock stability in order to obtain lateral stability with positive wing tips.

Clearly, a machine so large as an aeroplane has too much inertia to spin in complete harmony with the wind. Sensitive weathercock directional stability is, therefore, not feasible in a practical aeroplane and positive wing tips are, therefore, unstable, although they may be reasonably steady.

From preceding remarks about veering winds and spinning, a clue to a possible principle of lateral stability suggests itself in the reflection that if a pair of wings experienced no tendency to cant when spinning, neither would they be disturbed by veering winds.

Other than a flat plate of zero incidence, the only form satisfying in this condition is one in which the wings have permanently negative (down pressure) tips. When angular acceleration of such wings takes place about the vertical axis, the negative tip is supposed to neutralise the increasing lift of the positive part of the wing.

It is, of course, a matter of experiment to show how far this condition can be satisfied with practical wings. In forward motion, the combined positive parts of the wings would have to support the *negative* pressure of the tips as an extra load on the machine. Part of the price to be paid for this form of stability would, therefore, be relative inefficiency—but one might well pay more than that for safety, seeing that the efficiency itself already costs so much.

Assuming the negative tips to be reasonable, let us consider their control. If they will not bank when spinning, the machine will be unsteerable by rudder in the absence of a neutral fin surrounding the c.g.—which is dismissed as impracticable.

Having abandoned the rudder, there remains the warp.

Suppose one wing tip to have its negative angle increased. The reaction will be obliquely downwards and backwards, giving rise to a simultaneous descent and retreat. Both movements are in the proper sense for a turn with this wing tip on the inside.

But, *while* the increased negative tip descends and retreats, it decreases its negative pressure, and so resists the movement of descent and retreat. So soon as the warp ceases, therefore, the bank and the spin also cease; the condition of banking is stable.

If the other wing rises and advances in sympathy, its negative angle is increased while rising *and* advancing, which increases the negative pressure and resists the movement; that wing also is stable while being banked.

Necessarily, the increased negative angle of the inner wing increases the resistance thereof, and so the inner wing tends to fly slower than the outer wing for the same expenditure of power. One essential to continuous steering with fixed control is thus satisfied.

According to the difference in warp, so is the difference in speed, and according to the difference in speed so is the difference in the lift of the positive parts of the wings. But, according to the difference in speed, so is the difference in negative pressure imposed by the negative tips. The lateral balance, therefore, is potentially stable while flying on a curved course.

The system is stable against spin, as has been shown, for as soon as the lower negative tip tends to retreat from its work, its angle becomes positive to its relative motion and the wing tends to rise, thus diminishing the bank. Alternatively, to assume that it advances without rising is to assume that it increases its work of its own accord and so destroys the balance of power.

Assuming the machine to make a circuit on the same level, the mean effective velocity of the positive parts of the wings is necessarily equal to the speed of straight flight; otherwise their lift will be inadequate and they will descend.

It follows, therefore, that the outer negative tip, if unwarped, will represent an enhanced load, which will necessitate increasing the negative pressure on the inner wing for equilibrium. In short, it will involve the expenditure of more power.

For economy, therefore, it would appear to be desirable to warp both wings simultaneously.

From a consideration of the conditions for stability, it is apparent that the act of banking is an expression of the force exercised by the pilot on the control lever. While he moves the lever the machine banks, and the limit of the bank is the limit of the warp—which latter is the limit to the efficiency of the machine for a given wing loading.

SHORT BROS.' NEW SELF-REGISTERING HEIGHT RECORDER.

AN instrument of interest and value to aviators is a new aneroid put on the market by Short Bros., the well-known aeronautical engineers of Eastchurch. The feature is that it contains means for automatically registering the maximum height attained in flight. When it is required to do this, a small knob at the left hand side of the instrument is pressed upwards before starting, and a finger can then move upwards during the ascent but is prevented from returning on the descent, and therefore the maximum height is recorded. Pressing the catch downwards relieves the finger and allows it to pull back to its normal position, when it will work as an ordinary aneroid. Attachments are provided on the case of the instrument so that it may be slung on elastic shock absorbers.

In some respects the aneroid resembles the balloon aneroid that Messrs. Short Bros. have had in successful use for several years. For instance, the revolving ascent and descent scale is retained, which enables the pilot to set the neutral index mark under the needle at any moment during the flight and thereby observe whether his subsequent motion is one of ascent or descent. The scale on the inner dial reading atmospheric pressure in inches of mercury is also useful for the purpose of comparing the aneroid from time to time with a standard barometer.

Taken all round, this instrument appears to us a thoroughly desirable acquisition for any flyer, and it may be taken for granted that Messrs. Short Bros.' experience of ballooning has taught them just what is the right thing for this class of work.

THINGS WE SHOULD LIKE TO KNOW.

WHO put the nut in Porte's engine.

? ? ?

If the *thing* who put it there thinks he's a man.

? ? ?

Whether they did not keep the wrong one when he was born.

? ? ?

How he would like an interview with "little" Mr. Koolhoven.

? ? ?

If there would be enough left for a funeral.

? ? ?

Whether there has been another dirigible visit from "over there."

"Over one hundred petrol tins have been picked up in the Solent."—(*Daily Mail.*)

? ? ?

Have they got time to play "Shell" out whilst we get ready.

? ? ?

Did Milton know all about air pockets.

"As in a cloudy chair ascending rides
Audacious, but that seat soon failing, meets
A vast vacuity; all unawares
Fluttering his pennons vain, plumb down he drops
Ten thousand fathom deep."—(*Paradise Lost.*)

? ? ?

Whether he isn't about the only man who ever found money in one.

? ? ?

Who was flying over Dover before daylight on Saturday last.

? ?

When a machine built for a 120-h.p. engine and fitted with one of only 40-h.p. flies 50 m.p.h. with two up, doesn't it say something for "design."

Isn't this quite a different thing to fitting a 45-h.p. engine in a machine built to take a 28.

? ? ?

Hasn't something of this kind been tried before with disastrous results.

? ? ?

And wouldn't it be as well if any new experimenter in this direction should "think it over."

? ? ?

Whether Desoutter would not feel quite "chuff" could he know what we were saying about him last Saturday evening.

? ? ?

Wouldn't the world be a better place to live in if our friends would only "open out" before the fact.

? ? ?

Will he please remember that this is no criterion as to what we shall say next time "he goes and does it."

? ? ?

The constant x of the Hendon aviette.

? ? ?

Had Garros "cold feet" when flying over Vesuvius.

? ? ?

Would a "drop o' the crater" have warmed him up.

? ? ?

Is the paying of airmen for days on which they fly only "playing the game."

? ? ?

If *they* were paid for days only on which they worked, would there be less golf and more "biz."

"WILL O'-THE-WISP."

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A MEETING of the Committee was held on Tuesday, the 7th inst., when there were present: Sir Charles D. Rose, Bart., M.P., in the Chair, Mr. Griffith Brewer, Col. J. E. Capper, C.B., R.E., Mr. G. B. Cockburn, Col. H. C. L. Holden, C.B., F.R.S., Prof. A. K. Huntington, Mr. F. K. McClean, Mr. Alec Ogilvie, Mr. Mervyn O'Gorman, Mr. C. F. Pollock, Mr. R. W. Wallace, K.C., and the Secretary.

New Members.—The following new members were elected: Harris Booth, Lieut. F. W. Bowhill, R.N.R., Capt. Frederick G. Kunhardt, 2nd Lieut. L. L. MacLean, J. S. de Morpurgo, Sydney Pickles, and Lieut. Henry D. Vernon, R.N.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

383. Lieut. George Negresco (Roumanian) (Bristol monoplane, Bristol School, Salisbury Plain).
384. Walter Featherstone (Bristol biplane, Bristol School, Brooklands).
385. Lieut. Eardley Todd (Welsh Regt.) (Bristol biplane, Bristol School, Brooklands).
386. Lieut. G. W. Mapplebeck (King's Regt.) (Deperdussin monoplane, Deperdussin School, Hendon).
387. Lieut. Jack Empson (4th Royal Fusiliers) (Bristol biplane, Bristol School, Brooklands).
388. Arthur Ewing, R.N. (Bristol biplane, Bristol School, Brooklands).
389. Capt. D. W. Powell (Northampton Regt.) (Bristol biplane, Bristol School, Brooklands).
390. Gordon N. Humphreys (Caudron biplane, Brooklands).
391. Lieut. A. B. Thompson (East Lancs. Regt.) (Bristol biplane, Bristol School, Brooklands).
392. Lieut. Lionel W. B. Rees, R.G.A. (Bristol biplane, Bristol School, Salisbury Plain).

Public Safety and Accidents Investigation Committee.—On the motion of Mr. G. B. Cockburn, the following reports of the Public Safety and Accidents Investigation Committee were unanimously adopted:—

REPORT ON THE FATAL ACCIDENT TO CAPT. PATRICK HAMILTON AND LIEUT. A. WYNESS-STUART, WHEN FLYING AT GRAVELEY, NEAR STEVENAGE, HERTS, ON FRIDAY, SEPTEMBER 6TH, 1912, AT ABOUT 7.15 A.M.

Brief Description of the Accident.—Capt. Patrick Hamilton, with Lieut. A. Wyness-Stuart as passenger, flying on a French Deperdussin two-seater monoplane, fitted with a 100-h.p. Gnome engine, left Wallingford on the morning of September 6th, 1912, for work in connection with the Army Manœuvres. When approaching Hitchin from the direction of Graveley, the aircraft was observed to become unsteady, shortly afterwards the wing to break, and the aircraft to fall to the ground. The aviator and his passenger were both killed instantaneously.

Capt. Patrick Hamilton was granted his Aviator's Certificate No. 194, on March 12th, 1912, and Lieut. A. Wyness-Stuart, No. 141, on September 26th, 1911, by the Royal Aero Club.

Report.—The Committee met on Tuesday, October 22nd, 1912, Wednesday, January 1st, and Monday, January 6th, 1913. The representatives of the British Deperdussin Aeroplane Company, Ltd., attended, and produced plans of the aircraft and gave evidence on various points raised by the Committee.

From the consideration of the evidence the Committee regards the following facts as clearly established:—

(1) That this aircraft was built in France about May, 1912. It had taken part in the Military Aeroplane Competition on Salisbury Plain during the month of August, 1912, and had been awarded the Second Prize of £2,000 in the Competition open to the world. It was subsequently purchased and taken over by the Government.

(2) That when the wing broke the aircraft fell from a height of at least 500 ft. from the ground.

(3) That the aircraft struck the ground nearly vertically and nose first, its fall being broken by a high hedge and bank, in such a manner that no parts of it could have been projected more than a few feet after it struck the ground.

(4) That parts of the structure of the aircraft, viz., an aluminium plate from the left wing spar, some pieces of the cabane struts, the cowl which covers the engine, and also parts of the engine, viz., two push rods, were nevertheless found some 600 feet away from the spot where the aircraft struck the ground, and somewhat to the right of the direction from which the aircraft was seen to come.

(5) That some part or parts of the engine, whilst revolving, had been in contact with the interior surface of the cowl or cover which is fitted over the upper portion of the engine, and that eight of the push rods had been broken off close to the crank-case of the engine.

(6) That the bolts which attached the outside cable to the underside of the front spar of the left wing sheared in the air.

(7) That a piece of the propeller was missing from one of the blades and has never been found.

(8) That the engine was overhung and not fitted with the front bearing recommended by the makers for this type.

(9) That the front strut of the cabane was supported above the engine.

Opinion.—The Committee is of opinion that the collapse of the aircraft was due to the breaking of the outer wires supporting the left wing by a derangement of the cabane whilst in flight, caused either by:—

(*a*) the fouling of the cowl by a valve-rocker owing to the fracture of a valve tappet, or

(*b*) the partial failure or breakage of the propeller which, throwing the rotating system out of balance, caused severe racking stresses and strained the attachments of the engine to such an extent that they ultimately gave way and the engine shifted. The engine attachments were too light for the engine.

Recommendation.—The Committee draws the attention of manufacturers, designers, and aviators to the risk involved by want of provision against the consequences of possible failure of parts of the engine or its attachments to the aircraft, when such failure would lead to the breakage of other and vital parts of the structure.

REPORT ON THE FATAL ACCIDENT TO LIEUT. WILFRED PARKE, R.N., AND MR. A. HARDWICK, WHEN FLYING AT WEMBLEY, ON SUNDAY, 15TH DECEMBER, 1912, AT ABOUT 12 NOON.

Brief Description of the Accident.—Lieut. Wilfred Parke, R.N., with Mr. A. Hardwick as passenger, flying on a Handley Page monoplane, fitted with a 70-h.p. Gnome engine, left the London Aerodrome, Hendon, on Sunday, December 15th, 1912, at about 11.50 a.m., with the intention of flying to Oxford. When approaching the Wembley Golf Links, after having been in the air about five minutes, the aircraft was observed to be flying tail down. When to the west of the Golf Links, the aircraft made a half-circle to the left, the pilot, possibly, having the intention of returning to Hendon. During this turn, he crossed over a line of trees, which brought him over the Links. The aircraft, when a short distance from the trees, fell to the ground, killing the pilot and passenger. The aircraft was completely wrecked.

Lieut. Wilfred Parke, R.N., was granted his Aviator's Certificate No. 73 on April 25th, 1911, by the Royal Aero Club.

Report.—The Committee met on Friday, December 20th, 1912, Wednesday, January 1st and Monday, January 6th, 1913, and heard the evidence of several witnesses. Mr. Handley Page, the designer of the aeroplane, also attended, and produced plans of the aircraft, and gave evidence on various points raised by the Committee.

From the consideration of the evidence the Committee regards the following facts as clearly established:—

(1) That the engine was not running well at the start from Hendon, and that the aircraft had considerable difficulty in leaving the ground and climbing.

(2) That witnesses agreed, that, during the journey from Hendon to Wembley, the aircraft was flying weakly.

(3) That the aircraft was flying into the wind on the west side of a belt of trees running along a ridge. From the end of this ridge, there is a somewhat sudden descent and a line of similar trees into the valley and to the railway at the bottom of it. The aircraft turned to the left beyond the belt of trees, crossed the line of trees and then flew parallel on the east side of the belt for about 120

yards before it fell, diving head first to the ground. The wind at the time was south-westerly with gusts. The portion of the belt of trees which may have had some influence on the accident runs due north and south, and therefore the wind was blowing at an acute angle to, and over, the trees.

(4) That before commencing the turn, the aircraft was about 40 ft. above the top of the belt of trees. After completing the semicircle, the aircraft was 60 ft. from the ground, *i.e.*, level with the tops of the trees, and after that, was at no time more than a distance of 50 yards away from the trees.

(5) That the field of view from the pilot's seat was very limited in the vicinity of the aircraft below the level of the wings.

Opinion.—The Committee is of opinion that the pilot put about owing to a failing engine, presumably with the intention of returning home, a distance of only a few miles. The Committee is of opinion that the accident was due to the failing power of the engine combined with the loss of flying speed on turning sharply, which loss was accentuated by the wind disturbances due to the configuration of the ground and to the presence of the belt of trees on the windward side. The pilot's field of view was undoubtedly restricted, but whether or not this affected his actions the Committee is not prepared to say.

Recommendation.—The attention of manufacturers and aviators is specially drawn to this particular accident, which emphasises the risk that is run in starting a cross-country flight with an aircraft, which, from one cause or another, is under-powered at the time.

The Committee again draws attention to the primary importance of a good field of view for the pilot.

Public Safety and Accidents Investigation Committee.

A meeting of this Committee was held on Monday, the 6th inst., at the Royal Automobile Club (by kind permission), at 8 p.m., when there were present: Col. H. C. L. Holden, C.B., F.R.S., in the Chair, Mr. A. E. Berriman, Mr. G. B. Cockburn, Mr. F. K. McClean, Mr. Mervyn O'Gorman, Mr. Alec Ogilvie and the Secretary.

Hitchin and Wembley Accidents.—The reports on these accidents were drawn up and ordered to be submitted to the Executive Committee with a recommendation that they be published *in extenso*.

Marske-by-the-Sea Accident.—The enquiry into this accident was resumed, the Committee proceeding with the drafting of the report, the completion of which was deferred till the next meeting.

British Empire Michelin Prizes.

At the Royal Aero Club, on Tuesday last, the Chairman, Sir C. D. Rose, Bart., M.P., presented Mr. S. F. Cody with a cheque for £600, being the prize awarded to him in connection with the British Empire Michelin Competition No. 2. A cheque for £500 was presented to Mr. H. G. Hawker, being the prize awarded to him in connection with the British Empire Michelin Competition No. 1. At the close of the presentation, a hearty vote of thanks was passed to the Michelin Tyre Co., Ltd., for their generous prizes, which have given so much encouragement to the industry in this country.

Gordon-Bennett Aviation Cup.

The cup having been won by a representative of the Aero Club de France, the race for 1913 will take place in France. The exact time and place will be announced later.

The nature of the contest will be decided at the meeting of the Fédération Aéronatique Internationale, to be held in Paris on January 28th, 1913, at which the Royal Aero Club will be represented.

Each club affiliated to the Fédération Aéronautique Internationale, has the right to challenge the holder, the Aero Club de France, and such challenge must be sent in before March 1st, 1913.

The Committee of the Royal Aero Club will select the three competitors to represent the British Empire, and intending candidates are requested to notify the Secretary on or before February 25th, 1913, of their willingness to compete, if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

Gordon-Bennett Balloon Race.

The cup having been won by a representative of the Aero Club de France, the race for 1913 will start from Paris on Sunday, October 12th, 1913.

Each club affiliated to the Fédération Aéronautique Internationale has the right to challenge the holder, the Aero Club de France, and such challenge must be sent in before February 1st, 1913.

The Committee of the Royal Aero Club will select the three competitors to represent the British Empire, and intending candidates are requested to notify the secretary on or before January 28th, 1913, of their willingness to compete, if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

Annual General Meeting.

The annual meeting will be held on Wednesday, March 19th, 1913.

Notices of motion for the general meeting must be received by the Secretary not less than twenty-one days before the meeting, and must be signed by at least five members.

Lecture by Mr. Handley Page.

Mr. G. Handley Page will deliver a lecture at the Royal United Service Institution on Wednesday, the 15th inst., at 8.30 p.m., entitled "The Comparison of Monoplanes and Biplanes with special reference to the Stresses of each type."

The Aeronautical Society has kindly placed a number of tickets at the disposal of members of the Royal Aero Club, which can be obtained on application to the Secretary.

Presentation to Library.

Messrs. T. O'Brien Hubbard and Charles C. Turner have very kindly presented a copy of their book, "The Boy's Book of Aeroplanes," to the Club Library.

166, Piccadilly. HAROLD E. PERRIN, Secretary.

ROYAL FLYING CORPS.

THE following appointment was announced in the *London Gazette* of the 3rd inst.:—

Military Wing—Second Lieut. Geoffrey de Haviland, Special Reserve, is appointed to the Reserve. Dated January 4th, 1913.

Special Reserve of Officers.—Royal Flying Corps.—Military Wing.—Norman Spencer Roupell, late Cadet Brighton College Contingent, Officers Training Corps, to be Second Lieutenant (on probation). Dated January 4th, 1913.

The following appointments were announced by the Admiralty on the 6th inst.:—

Lieut. P. A. Shepherd, to the "Actæon," additional, as Flying Officer. Dated December 5th, 1912.

Capt. C. E. Risk, R.M.L.I., to the "Actæon," additional, as Flying Officer. Dated December 5th, 1912.

Lieuts. I. T. Courtney, R.M.L.I., and G. V. Wildman-Lushington, R.M.A., to the "Actæon," additional, as Flying Officers. Dated December 5th, 1912.

The following appointments were announced in the *London Gazette* of the 7th inst.:—

Military Wing.—Capt. Tom I. Web-Bowen, the Bedfordshire Regiment, to be a Flight Commander, and to be seconded. Dated December 5th, 1912.

Lieut. Alexander E. Burchardt Ashton, 4th (Royal Irish) Dragoon Guards, to be a Flying Officer, and to be seconded. Dated December 5th, 1912.

Questions in Parliament.

IN the House of Commons last week, Lord Winterton asked the Secretary of State for War whether the officers and men allocated for service under the Royal Naval Airship section are paid according to the number of ascensions made instead of by daily allowance; and, if so, what were the considerations upon which this discrimination between members of the aeroplane corps and of the airship section was based.

Dr. Macnamara replied:—Both in the Military and Naval Airship sections the officers and men are entitled to flying pay under existing rules for days of ascent only, unless they are qualified aeroplane flyers. I may add that the whole matter is at present under the consideration of the Board of Admiralty.

Colonel Seely, replying to Mr. Joynson-Hicks, stated that officers are required to learn to fly and to obtain a Royal Aero Club certificate before being taken for a course of instruction in military flying, but it is left to them to decide where they will go to learn. Of the 111 officers who have obtained certificates and have been selected for the Royal Flying Corps, 108 obtained them after receiving instruction in Great Britain at civilian flying schools. Arrangements have been made for accommodation for Army aeroplanes at four civil aerodromes, and the War Office is prepared to extend this number if other civil aerodromes in suitable places are ready to enter into agreements on the terms already arranged. No officers have been sent to learn to fly at foreign schools, but one officer has recently gone to a French flying school at his own wish.

FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

THURSDAY, last week, was practically the only day of the week when flying was possible on anything like a large scale, and full advantage of the ideal weather conditions was taken by all the flying schools. Mr. Barnwell did some excellent flights on the Vickers monoplane at a height of well over 6,000 ft. Mr. Raynham delivered the last Flanders monoplane to the Army authorities and put it successfully through the severe tests imposed. Mr. Merriam was busy with the Bristol pupils, taking several of them up to an altitude of over 2,000 ft., and making spiral descents from that altitude with engine cut off and propeller stopped.

No flying at all was possible Saturday owing to the rough conditions, and on Sunday, owing to the very bad weather, the visit of Santa Claus was postponed till Sunday, January 12th, at 3 p.m., when, weather permitting, Santa Claus will visit the flying ground on his aeroplane, and will distribute gifts to every child under 14 years of age, in exchange for a ticket, which can be obtained from the gatekeeper on first entering the ground. The competitions which were to be held on the above date have also been postponed till next Sunday week. The same entrants.

Notwithstanding the weather conditions, and the notices posted at the gates announcing the postponement *en bloc* of the programme arranged, a large number of members and friends put in an appearance. The Coventry Ordnance Biplane was undergoing engine tests inside the shed, and the first fine weather will see its appearance in the air, as also the new Vickers monoplane—both of these machines are fitted with engines of 100-h.p. The Bristol School also has a new tractor biplane, which is expected to turn out a very speedy machine.

Amongst the recent batch of Bristol pupils qualifying for their *brevet* is Capt. Powell, of the Northamptonshire Regiment, who took his ticket on Saturday, December 21st. Everybody remarked how well he went during the test, especially in view of the fact that he had only made one previous circuit, and that on the day before.

Bristol School.—On Monday last week no flying was possible in the morning, the weather being too bad. Bendall tested conditions in the afternoon, then taking Capt. Rickards and Mr. Arthur, a new pupil, for tuition flights. Wind was too strong for further work.

Merriam made several tests during Tuesday morning and afternoon, but found the conditions to be too bad for school work.

On Wednesday, after an early trial, Merriam took up Mr. Neville, a new pupil, for a couple of circuits. Rain and wind caused stoppage of flying. Merriam out again later with Lieut. Thompson as passenger, but found no improvement. Lieut. Blatherwick was taken for his first circuits, after which tuition was carried on in the hangars.

Capt. D. W. Powell (Northamptonshire Regt.), who took his *brevet* at the Bristol School at Brooklands just before Christmas. Capt. Powell is an exceptionally fine flyer, and should be a valuable addition to the Royal Flying Corps.

In the afternoon Merriam took Capt. Rickards for a trial, after which the Captain took the instructor as passenger for a couple of straights. Bendall was out in the meantime with Mr. Neville and Lieut. Blatherwick, Lieut. Thompson making four good straights. Merriam took Lieut. Blatherwick for landing practices, also giving a flight to Mr. Neville. Lieut. Thompson was out again for straights, Merriam finishing up the day's work by taking Capt. Rickards for a flight.

Merriam made the first test on Thursday, afterwards taking Lieut. Thompson for tuition in right and left-hand turns, this pupil then going out alone completing several good straights and circuits. Bendall was out on another machine, first for a solo, and then with Mr. Neville and twice with Lieut. Blatherwick. Capt. Rickards was first taken up by Merriam, and then went out alone for the first time, showing signs of great improvement. Mr. Archer was out for tuition with Merriam, work being then abandoned until after breakfast.

Lieut. Thompson then went for a really fine solo, describing excellent figures of eight, and showing himself capable of undergoing the tests for his *brevet* at the next opportunity. Bendall was out with Mr. Neville and then with Mr. Archer, Merriam taking Mr. Blatherwick for a long flight, the pupil then taking the pilot's seat for several flights. Capt. Rickards and Mr. Lane were both out for straights, the latter doing several good circuits. The morning's work was finished by Lieut. Thompson being taken for a high flight, receiving tuition in landing by means of a *vol plané*.

Bendall made the test on Friday, Merriam following on another machine, Lieut. Thompson also being up for a good solo, after which he successfully accomplished the tests for his certificate, passing same in fine style and flying very steadily throughout.

No flying possible all day Saturday owing to the extremely high wind with rain at intervals.

Weather bad all day Sunday and flying impossible.

Howard-Flanders School.—Wednesday, last week, Raynham was testing F 4 No. 4 for first time out at noon. He made several circuits, and then returned for adjustments. At 3 p.m. several more circuits, when she was working all right.

Thursday, Raynham out at 9.45 a.m. for several circuits. At 10.8 a.m. he started for Farnborough, and completed all War Office tests. Climbed 1,000 ft. in 3 mins., and got a speed of 67 m.p.h. Altogether a pretty nice performance with only one day for testing machine, and to pass all tests at first attempt.

Vickers School.—The pupils not having recovered from the Christmas holidays, no flying was done Monday last week, except two short flights of 10 mins. each by Messrs. Barnwell and Knight, in the afternoon, on No. 5 monoplane.

Wind prevented flying next day until late in the afternoon, when Mr. Barnwell was out for about 10 mins. on monoplane No. 5.

On Thursday, early in the morning, Knight was out with both biplanes, doing about a quarter of an hour on each at about 400 ft., the weather being quite calm. After breakfast Barnwell made a test flight on No. 5 monoplane, then gave place to Knight, who was out about 10 mins., rising to a height of about 800 ft. Barnwell then made a flight of about half an hour on No. 5 monoplane, reaching a height of rather over 3,000 ft. In the afternoon Barnwell again took this machine out, and climbed to a height of 6,100 ft., being in the air just over an hour.

Eastbourne Aerodrome.

ON Thursday, last week, the weather was all that could be desired, and an excellent day's work was put in. The 28 Anzani was got out first, and as some adjustments had been made to the controls, Mr. Fowler took the machine for a trial circuit before handing it over to Lieut. Laniger. The latter then made two very nice flights, showing good judgment both in getting off and landing. Shortly after this Fowler went for a solo on the Bristol, and then took up in turn Lieut. Minchin and Messrs. Roberts and Thornely. Lieut. Minchin made good progress, and should shortly be ready to do his first solo. After lunch Mr. Hammond took charge of the pupils, and Lieut. Laniger made several short flights, but found the wind somewhat troublesome. On one occasion he started out for a right-hand circuit, and, much to the alarm of the spectators, disappeared behind the gas works, heading straight for the town. A breakdown gang, with a car, immediately started out, and Mr. Hammond also flew over with Yates as passenger. Everyone fully expected to find the Anzani on a roof, or something of the kind, but Lieut. Laniger had made an excellent landing in a small field on the very edge of the houses. Apparently he found the wind too much for him as soon as he tried turning to the right,

and realising he was getting unpleasantly near the town, he did the best thing possible under the circumstances, and landed.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Monday, last week, majority of pupils still away on Christmas vacation. Manton took out school 'bus for four circuits, after which Mr. R. H. Carr was doing straighs, and continuing to show great improvement. Noel testing *brevet* machine for Manton, a Grahame-White 1912 pupil who had signified his intention of competing for the cross-country flight prize of £100 offered by the Company. After Manton had made further tests with this machine, prior to making his attempt in the afternoon, engine trouble arose, and it was necessary to postpone the attempt until the next day.

Tuesday was the last day on which the 1912 pupils could compete for the £100 cross-country flight prize, but owing to bad weather it was impossible for an attempt to be made. Next two days very bad weather prevailed, and wind was too strong for school work.

On Thursday, in the afternoon, the usual Thursday exhibition flights were given by Messrs. Noel and Desoutter before quite a large number of people for the time of the year. Mr. Gates was flying the No. 5 machine for ¼ hour, followed by Mr. Sydney Pickles and Mr. Manton. Later in the afternoon, Desoutter made another flight on the Blériot, while a new pupil, Mr. Cheeseman, was making straights on the school 'bus. During the afternoon Mr. Noel, in addition to his exhibition flights, carried three passengers.

Aircraft Co. School.—Saturday last week Verrier out testing new Maurice Farman in a strong wind, flying in his usual brilliant style.

Monday, January 6th, Verrier started for Farnborough, carrying Lieut. Conran as passenger. Very rough weather was encountered, on account of which a detour was made by landing at Brooklands. Later, he arrived at Farnborough and put the machine through the necessary tests before handing it over to the factory officials.

Blackburn School.—Several flights during Wednesday, last week, were put in by Mr. H. Blackburn testing the rolling machine. In the afternoon Mr. Laurence Spink had 15 mins'. practice in straight flights.

Friday there were several test flights on rolling machine by Mr. H. Blackburn.

Blériot School.—Lieut. E. Conran had No. 3 out for circuits Monday, last week, but finding the wind too strong for comfort the machine was returned to the sheds. On Wednesday afternoon Lieut. Conran and MM. Teulade and R. Desoutter all put in a good spell of work, the former doing several very good circuits and *vol planés* on No. 3, and R. Desoutter doing excellent straights on No. 1. M. Teulade did several very good straights which he thought, considering his long absence from the school, to be wise before continuing his circuits.

On Thursday Lieut. Conran put up a series of circuits after Mr. Slack had tried the air on No. 3, which flew exceedingly well on about half throttle, and landed very nicely each time. MM. Teulade and Desoutter did some nice straights, and Mr. Williams was doing rolling practice on No. 1.

Deperdussin School.—Weather much too boisterous for school work all day Tuesday last week.

On Wednesday, Mr. Brereton brought out *brevet* machine No. 3, and after testing handed same over to Mr. Valazzi, who put in some very nice straight flights, landing very neatly. Mr. Scott also made several good straights showing very steady progress, and almost ready for his *brevet* tests. Mr. Phelps was put on to this machine, and found it to his liking, handling it very well.

Mr. Brock and Mr. Brereton were both busy Thursday testing No. 3 and No. 4 machines respectively. The engine in No. 4 not pulling quite well it was taken back to the shed to be overhauled. No. 3 *brevet* was handed over to pupils, Messrs. Scott, Phelps, Valazzi and Andrews, who all put in some very useful practice, making straight flights and good landings.

Weather again too rough for pupils Friday and Saturday.

Monsieur Deroye, on Monday, made a magnificent flight across country for about three-quarters of an hour, not knowing the district very well he lost his bearings for a time, but eventually found his way back again safely.

Messrs. Valazzi, Scott, Phelps, Whitehouse, and Andrews all got in a very good morning's work on No. 3 machine, handling well, and making fine progress, and promising a good crop of *brevets* in the near future. Mr. Brock was testing conditions on No. 4 machine, but after a couple of circuits decided the wind was too high for pupils' practice.

W. H. Ewen School.—All the pupils are back at the school again fresh for work after the season's festivities. Unfortunately, the weather has not been over favourable for flying practice, but every advantage has been taken of the chances that offered.

On Wednesday last week M. Baumann had some of the pupils out getting in good practice. Mr. M. Zubiaga making excellent progress in his straights on monoplane No. 1, while Lieut. Bayly put up several fine straight flights with good landings on the 28-h.p. Caudron biplane.

On Thursday, all the pupils were out under the instruction of Mr. Ewen and M. Baumann. Commencing at 2 p.m., practice was continued all afternoon until dusk. M. Baumann gave instructional flights to Lieut. Moxley and Messrs. Zubiaga and McGregor, each of whom afterwards did some good solo work on the 28-h.p. Caudron. Lieut. Bayly was also on the 28-h.p. Caudron, and put up some very neat short flights, showing capital judgment in his landings.

Messrs. Russell, Lawford and Warren were in turn flying the 35 two-seater Caudron, and are getting well on their way for their *brevets*. M. Baumann was also out for a flight on the 35 two-seater Caudron, and put up a fine exhibition. Rising to nearly 1,000 ft., he made a splendid semi-spiral *vol plané* back to the aerodrome. At the close of the school work Mr. Ewen was out on the two-seater Caudron, taking his wife with him as passenger.

Salisbury Plain.

Bristol School.—Jullerot was first out on Monday, last week, afterwards giving tuition to Lieuts. Vernon, Marix, Bowhill, Vaughan, Littleton, and Bigsworth, all of these pupils also being taken out by England. Bigsworth, Vernon and Bowhill were taken out a second time, and then ascended in the pilot's seat with the instructor behind. Lieut. Rees was on one of the biplanes for three really fine solos, whilst Prince Cantacuzene made his first flights on the 80-h.p. Bristol monoplane flying extraordinarily well, with a good landing.

Conditions too bad all day Tuesday and work was confined to the hangars.

On Wednesday, Lieuts. Bigsworth, Vernon, Bowhill, Littleton, Marix, and Vaughan were all given a flight each by Jullerot, Busteed and England. Lieut. Rees put up two fine flights on one of the biplanes, Prince Cantacuzene ascending on a 80-h.p. Bristol, and remaining aloft for 40 mins., after which he again went for another solo lasting 20 mins., his landings being excellent. Wind was quite strong.

Jullerot took Lieut. Bowhill on Thursday for his last tuition flight, this pupil then going for his first solo, making a good flight, Lieut. Bigsworth being also out for a solo, flying well. Busteed made a couple of tests of a school single-seater monoplane, then taking up Lieuts. Vernon, Vaughan and Marix for biplane tuition. England was busily occupied in giving three trips to Lieut. Vernon, one to Lieut. Bowhill, one to Lieut. Rees, and three each to Lieut. Vaughan and Mr. Tower. Jullerot gave two flights each to Lieuts. Marix, Littleton, Vaughan and Vernon, and Mr. Tower later again taking up Lieuts. Marix and Vaughan. Prince Cantacuzene was out for a solo on an 80-h.p. Bristol, landing after a flight lasting half an hour. Lieut. Rees then set out to

Lieut. A. B. Thompson (East Lancs. Regt.), a Bristol pupil at Brooklands, who has just taken his certificate in record time. Both he and Capt. Powell went through without so much as breaking a wire or any mishap.

undergo the first half of the tests for his certificate which he accomplished in fine style.

On Friday, wind and rain completely prevented flying all day. Very little improvement in the weather on Saturday, and yet another day had to be spent upon the machines in the hangars.

Royal Flying Corps.—On Wednesday week Air Mechanic McCudden was out testing Maurice Farman biplane 214 and afterwards Lieut. Wadham took over the machine and put up a fine flight. This officer, Lieut. Wadham, was first out on Thursday morning testing the weather on the Maurice Farman 214. Lieut. Carmichael afterwards went for a trial flight, but owing to a ground fog on landing he ran into the fence of the Bristol hangars with disastrous results to the propeller. Fortunately the pilot escaped unhurt. In afternoon Air Mechanic McCudden put up an excellent flight, flying for one hour at a height of 4,000 ft. Lieut. Wadham then did some scouting round the Plains. Major Brooke-Popham was out on BE 203 biplane, which has been overhauled. He made five flights, including one of 30 mins., in which after a height of 5,000 ft. was reached his engine went wrong. A graceful descent was made, and on landing it was found that a tappet-rod had broken. During Friday, Saturday, and Sunday work confined to workshops owing to bad weather.

As soon as fog lifted on Monday morning the conditions were ideal for outdoor work, and Lieut. Wadham started on Maurice Farman 216, going up to a height of 4,300 ft., being in the air 30 mins. Subsequently he went up with Pte. Barlow as passenger for a 15 mins.' flight. Lieut. Carmichael also made two flights, and then Major Moss took over machine, and did some scouting practice with Sergt. Goodchild. Effective machines are now pretty scarce, there being at present only one for use by officers and men.

South Farnborough.

Royal Flying Corps.—The great nations of the world have quickly recognised the practicability of aircraft for military purposes, and are rapidly organising fully equipped air fleets and training men for the exciting and risky work of handling aircraft in all weathers and over any sort of country. These are the men who will be of the greatest possible value to an army when the "dogs of war" are loosed. It is to be hoped that the *personnel* of the Royal Flying Corps will be rapidly brought up to its full strength this new year. It has been proved on more than one occasion that a trained observer on a fast aeroplane can collect accurate information of an enemy's movements during a few hours flight that would in the ordinary course of events take trained cavalry scouts several days to obtain. One of the features of the coming year is likely to be the designing and building of destructive aircraft for the purpose of attacking and putting out of action an enemy's aircraft and affording protection to its own air scouts.

The new year opened with some fine flights by the officers of the Royal Flying Corps. Tuesday, December 31st, was a very rough morning indeed, with a strong south-westerly wind blowing in heavy gusts. Major Raleigh, the commander of No. 4 Squadron, made a splendid flight on Breguet 210, despite the high wind. Wednesday the wind was in the south-east, and the day was very cloudy. Flying, however, commenced in the morning, and a good number of flights were made. Capt. Brabazon was over Ewshott on the Maurice Farman 215, but was only away about 10 mins. Capt. Pigott then went for two short flights. Lieut. Herbert then taking the machine over, and steering over Farnham with Lieut. Gould, he being out about 20 mins. Lieut. Herbert also took out Capt. Brabazon on the same machine for a short flight. Capt. Becke, who is acting Squadron Commander to No. 2 Squadron during Major Burke's absence, went out over Ewshott and district for about 23 mins. Air Mechanic Skinner was in the passenger seat. Major Raleigh, No. 4 Squadron, was on the Breguet 210, accompanied by Capt. Beor. BE 206 was out twice, piloted by Lieut. James. Lieut. de la Forte was also on the same machine for a short spin. Thursday opened misty and calm. Lieut. Herbert, on 215 Maurice Farman, went out for a quarter of an hour accompanied by Lieut. Gould, afterwards going out again alone. Capt. Becke made a short flight on Maurice Farman 266, and afterwards took up Air Mechanic Braithwaite for about 10 mins. at an average altitude of 1,000 ft. Lieut. James made a splendid flight on BE 206, reaching an altitude of 5,000 ft. Lieut. de la Forte afterwards doing three short flights on the same machine. Lieut. Herbert then went in the Maurice Farman 215 taking up Air Mechanic Ling. They were out about twenty minutes at an average altitude of 1,200 ft. Capt. Pigot then took the same machine for about quarter of an hour, flying at about the same height. Friday opened rather stormy. A south-westerly wind was blowing, accompanied by rain. Lieut. James and Lieut. de la Forte were out about twelve minutes each.

On Saturday there was no flying. Monday, January 6th, there was a moderate S.S.E. wind, and the day was cloudy, with rain at intervals. Capt. Brabazon was on the Maurice Farman for about 20 mins., at an average altitude of 1,000 ft., Capt. Pigot took the same machine out twice, once for about quarter of an hour, and again for just over half an hour. During the latter flight he was flying at an average height of 1,000 ft. Lieut. Herbert on Maurice Farman 215, with Lieut. Gould accompanying him, was out about 20 mins. and did a fine spiral *vol plané* from a height of about 1,800 ft. Lieut. Gould then made two short solos. Capt. Becke with Air Mechanic Baughan went out on the Maurice Farman, 266, and were lost to sight over Laffan's Plain, in a sharp rain-storm. They were flying at a height of about 1,400 ft. Capt. Becke, accompanied by Major Raleigh, then went on the same machine, although it was still raining, and were out for about 10 mins. Major Raleigh was also out twice during the morning on Breguet 213, afterwards going upon BE 206, for 20 mins., finishing with a splendid spiral *vol plané* from a height of about 2,000 ft. Lieut. Lawrence was also out twice, each flight totalling about 18 mins.

Tuesday was rather rough as there was a gusty 30-mile wind blowing which made things very bumpy. Lieut. Herbert went on Maurice Farman 215 for about a quarter of an hour and Lieut. Lawrence and Capt. Beor were on BE 206 for about 10 mins.

Some fine flying was witnessed Thursday, January 2nd, when Raynham manœuvred over Farnborough Common on the Flanders monoplane. He also made some fine flights on the BE type machine 204 and BE 2. Verrier was also out over Farnborough Common putting a Maurice Farman through its tests. He brought the machine over from Hendon.

Airship Squadron.—The Gamma made several trips under the command of Major Maitland last Thursday, and presented a pleasing sight as she gracefully manœuvred over the common. On Monday while she was out it came on to rain sharply, and after manœuvring for some time was taken back to her quarters in the big balloon shed.

⊛ ⊛ ⊛ ⊛

FLYING AT HENDON.

IF there was not much flying done up at Hendon last Saturday an incident occurred which provided plenty of excitement—and, at the time, a little anxiety. Before dealing with this matter, however, let us give a brief account of the flying that took place during the afternoon. Early in the day the wind was very strong, and it hardly looked as if there would be any flying. At twelve minutes past three, however, Pierre Verrier brought out the 75-h.p. Maurice Farman biplane and taking with him a passenger, after a preliminary run across the ground in order to get a start against the wind, soon rose to a great height. One could judge the force of the wind by observing the behaviour of the biplane, which at times appeared to stand quite still and then bound forward. Verrier remained up for quite a long time and attained a height of about 1,200 ft. Louis Noel also made a flight on the 80-h.p. Henry Farman biplane lasting 6 minutes, and at a height of 300 or 400 ft. Marcel Desoutter then started on his eventful journey after having his 50-h.p. Gnome-Blériot taxied across the ground so as to face the wind. After flying about the aerodrome for a few minutes at a height of 500 ft. or thereabouts he commenced to climb, and it was not long before he disappeared from view among the clouds, about 1500 ft. up and heading for Finchley. In the meanwhile Verrier was out again with a passenger on another Maurice Farman biplane. It was now almost 4 o'clock and beginning to get dark, but there was still no sign of Desoutter. As it was apparent that he must have lost his bearings, some rockets were sent up for the purpose of indicating the location of the aerodrome. A little later on a bonfire was lit as well. Still he did not return, so telephone messages were sent out to all the likely places round about. The only news thereby obtained was that he was seen at Mill Hill where he attempted to turn, but was apparently unable to do so; a further message came to the effect that he had been seen flying over Potters Bar a little after four o'clock and was going well in the direction of Cheshunt. All efforts to find any further trace of him were futile, and by seven o'clock everyone was in a pretty anxious state of mind, it being feared that he had made a rough and unobserved landing in some uninhabited district.

Just before 7.30 p.m., to everyone's relief, the by then "lost-for-sure" aviator walked into the aerodrome as if he had only just been across the way to have a cup of tea! It appears that in order to avoid the nasty wind low down he rose to a height of between 3,000 and 4,000 ft. and got blown out of his course, completely losing sight of the aerodrome. Observing what he took to be the Welsh Harp water he descended, only to find he was at Cuffley, which is between Potters Bar and Cheshunt, just above Enfield. He attempted to make a fresh start, but was unable to do so as some labourers whom he asked to start his engine refused to, so he had to secure the monoplane for the night and return home by train, none the worse for his adventure.

EDDIES.

ALTHOUGH aviation has had a great deal more support from official quarters in France than it has here in England, things have not been going too well with some few French firms of late. News came, not so long since, that M. Roger Sommer had decided to give up his aeroplane manufacturing business at Monzon, and to return once more to devoting all his energies to his former business, that of felt manufacturing. He had hoped, it is reported, that his new stabilizing device, which FLIGHT described fully in the report of the last Paris Aero Show, would have put his machines in greater favour with the Government. It has not done so, it appears, and for this and other reasons, perhaps better known to himself, M. Sommer decided that it was better not to continue.

* * *

It came as a still greater shock to me to hear a few days since, from a friend of mine in Paris, that M. Robert Esnault Pelterie has decided to retire as well. His reason was, so I was told, that he had spent so much on aviation and was getting so little in return. M. Esnault Pelterie, as designer and constructor of the celebrated R.E.P. monoplanes and engines, was one of the very first of monoplane pioneers in the world, and his work all through is generally recognised as being some of the very cleverest that has been directed towards the perfection of the flying machine.

His monoplanes have been universally written down as the best specimen of a pure engineering job among aeroplanes of French origin. And yet, in spite of the good performances that stand to their credit, it is evident that they do not sell sufficiently well. Where then has M. Robert Esnault Pelterie failed? Are his machines listed at too high a price? Are they, being mainly of steel, too difficult to repair when they become damaged? Wherein does the trouble lie?

* * *

Coming back to our British industry, it occurs to me there will be soon a good opening for a collapsible hangar that is capable of being dismantled in a minimum of time and stowed away on an ordinary sized motor car of the type that is usually employed to chase aviators with spare parts when they are undertaking a long flight.

At the new Isle of Grain Naval Air Station at the mouth of the Medway, there is a French Bessonneau collapsible hangar erected, and this fact, even if the Navy have not yet acquired the hangar in question, indicates that there should be a demand for them.

* * *

It struck me as being rather interesting to hear that the French Astra firm, who are at present constructing an Astra-Torres dirigible to the order of the British Government are obtaining their proofed fabric for this and other machines from a Scottish firm—the "W.W." Proofing Company of Glasgow.

* * *

Messrs. J. Samuel White and Co., Ltd., of East Cowes, I.W., a firm of Government contractors who have up to the present time specialised, apart from their ordinary yachting work, in the production of torpedo boat destroyers and Diesel engines, have decided to put in operation an aviation department, which will be under the direction of Mr. Howard T. Wright. His pioneer work in connection with aviation is too widely known to need enlarging upon. Under Mr. Howard Wright's direction they intend to commence, straight away, on the construction of hydro-aeroplanes, land aeroplanes, and aeromotors, which latter will be of the stationary-cylindered air-cooled variety. Their first machine to be turned out will be a hydro, equipped with a 160-h.p Gnome engine, and furnished with lifting surfaces of a new design of Mr. Howard Wright's, which has given unusual promise as the result of laboratory experiments.

Most of us will have the opportunity of seeing this interesting new machine, if not before, at the forthcoming Aero Exhibition at Olympia next month.

* * *

Young Marcel Desoutter, he is, by the way, only nineteen years of age, and withal one of the very soundest of the monoplane and biplane pilots we have in this country—had some rather unusual experiences on Saturday last at Hendon. Going up for one of his exhibition flights, which as a rule last about twenty minutes, he rose and was above the clouds by the time he had reached an altitude of 3,000 ft. While it was rather gusty near the ground, it was quite calm above, and by the appearance of the clouds below him he judged that the wind was simply a ground wind. Thus, being confident he could find the aerodrome again, he stayed up above the clouds for five minutes, keeping his mind's eye in the direction in which the aerodrome ought to lie.

* * *

He had no compass on board, so that he simply had to rely on his own sense of direction. As it happened there was a high wind at the height at which he was flying, and so when he came down where he thought the aerodrome ought to be and started looking around for it he found that "someone had taken it away" as he put it. A little later he spied a patch of water which he mistook to be the Welsh Harp waters at Hendon, and as it was getting quite dark he reckoned it best to get on dry land. The field he selected was on the side of a fairly steep slope. It had seemed perfectly flat till he was just on the point of touching the ground. Luckily he landed up the slope.

* * *

From the rustics who gathered around he learned that he had descended at Cuffley, a little village in Hertfordshire. Finding out from them his true direction back to the aerodrome, and that he was less than ten miles away, he determined to start back again and addressed one of the said rustics with a view to getting him to give his propeller a pull over. To Desoutter's astonishment he replied "It ain't no good, guvnor, I wouldn't lay me 'ands on the thing, not if you give me a 'undred quid." As a matter of fact, all the rest of them who were there had the same holy fear of the machine, for it was the first time they had seen an aeroplane. Seeing that it was useless to attempt to get off, Desoutter asked them if they would be good enough to help him push the machine under the shelter of a tree. They were even too frightened to do that, and so he had to do the job by himself.

* * *

Having got the machine well pegged down and covered over, he made an attempt to let the aerodrome people know of his whereabouts, but he could find no 'phone in the place; so he waited forty minutes for a train, and by a very roundabout route got back to the aerodrome about a quarter past seven, much to the relief of his friends there. They had almost given him up for lost, had lighted flares and sent up rockets to guide him should he see them, and had telephoned to most places within

a twenty-mile radius north of the aerodrome in an effort to determine his whereabouts.

* * *

I hear that the principal documents in connection with the formation of the new private company of A. V. Roe and Co., Ltd., were signed on Monday last, and that by the time these lines appear the company will have been registered. Two who have become largely interested in the concern are Mr. J. Grimble Groves, J.P., formerly M.P. for Salford, and Capt. Lutwyche, late of the 5th Royal Warwickshire Regiment. The former gentleman is a man of great experience in business matters, and, as Mr. H. V. Roe points out, his services will be a very valuable asset to the firm. Capt. Lutwyche saw active service in South Africa, and so it may be relied upon that he knows the value of the military application of the aeroplane. He was one of the first to take up motoring as soon as the red flag restriction had been removed. He was a pioneer—and he has joined pioneers.

* * *

They intend to find new works, for, owing to the growth of their business, they have extended from time to time, until to-day there is not another inch of room available at Brownsfield Mills. They have, so I hear, found a difficulty in coming across new premises suitable for the purpose. They hope to have finished their search by the end of this month.

* * *

There is a rumour around to the effect that the celebrated Bristol Co. of aeroplane manufacturers are directing their attentions towards the production of a new tractor biplane for military purposes. It will be of a type somewhat on the lines of their present tractor biplane designed by Mr. Gordon England, but influenced, probably, by the BE type of Army aeroplane. Coanda, their clever designer, has the work in hand, and I am assured that the machine will be one of unusual promise.

* * *

I believe I mentioned before at some time what a lot of musical and general talent, apart from that they show in the course of their business, there is among flying men. Starting with Ewen, he was, before he took up aviation, one of the cleverest organists in Scotland. Grahame-White can sing a sentimental song with anyone. Fleming, when he was amongst us, provided many a happy diversion with his mandoline. Pizey, following in his brother instructors' footsteps, acquired considerable efficiency on a one-stringed fiddle. Wheatley, who was for some time at the Brooklands Avro school, played the piano extraordinarily well, and Messrs. Ronald L. Charteris and Lang are amateur actors of no mean order.

* * *

Capt. C. M. Waterlow, of the Royal Flying Corps, must also take his place, and a prominent one, amongst those who have abilities in this direction. Last Tuesday night he produced at the Farnborough Town Hall, a musical fairy play, "Stella and the Elves," which he had written, composed and rehearsed. I am rather wondering whether he had more trouble in the producing of it than in the writing and composing combined, for there were 33 children in the cast.

* * *

Of the new 35-h.p. Grahame-White biplane just completed, a batch of six are to be constructed, some of which are to be set aside for the use of the pupils learning to fly at the Grahame-White School.

Another Grahame-White machine, in the designing of which Mr. H. Barber has had a large share, will probably make its appearance early next week, and its test flights will be carried out by M. Louis Noel. It is an extensioned biplane, driven by a 90-h.p. 6-cylinder Austro-Daimler motor. One of the main features of the design is that the engine is arranged in front of the pilot, while the propeller is to his rear—a disposition that, while making for great safety, increases the value of the machine from a military view-point. The tail is supported by an open *fuselage* of triangular section, the top member of which runs from the body to the tail, passing through the propeller-boss. The body, it is interesting to note, has a plan form identical with the strut cross section with which Mr. Alec Ogilvie obtained the best results in his recent efficiency tests. The landing-gear is, to a certain extent, reminiscent of that with which the Sommer biplane was equipped at the last Aero Show in Paris, except that it is much more soundly constructed, and double-tyred wheels are provided. But for the trouble the Grahame-White works have had with the fuel tank that was originally intended for the machine, it might have been flying before now.

* * *

It is to be hoped that readers will show, in a practical way, their sympathy for Mrs. Hardwick, who, through the sad accident that caused the death of her husband and Lieut. Wilfred Parke, has been left with three children of tender years, without adequate means of support. A fund has been instituted to relieve her needs, which has been headed by Messrs. Handley Page with a subscription of fifty guineas. Subscriptions, made payable to Mrs. Hardwick, in the case of cheques, should be forwarded to Messrs. Handley Page, Ltd., 72, Victoria Street, London, S.W.

* * *

A new 100-h.p. all-steel aero motor, upon which the works of the A.B.C. Engine Co. have been busy of late, is expected to be finished in a little over a week's time. Their smaller 50-h.p. model, which appeared not long since, is one of unusual interest. It is an 8-cylinder air-cooled motor of V-type, with its cylinders, of $2\frac{1}{2}$-in. bore and $2\frac{1}{4}$-in. stroke, mounted on a tubular crank-case. The crank-shaft revolves at a normal speed of about 4,200 revolutions per minute, and through a 6 to 1 reduction gear drives the propeller-shaft, set in the V between the cylinders. The propeller-shaft is also made to serve as a cam-shaft. The motor only weighs 112 lbs.

* * *

My congratulations to another well-known pilot who has become a bridegroom, and the same wish to his bride. On Wednesday last, at Wraysbury, Lieut. Barrington-Kennett, of the Royal Flying Corps, married Miss Violet Hargreaves, elder daughter of Capt. Hargreaves of Newenham Park.

* * *

I am glad to see that Mr. W. H. Ewen has won the case he entered against the Kirkcaldy Horticultural Society, claiming £50 that they should have paid him under his contract with them to fly at Raish Show. I am thinking that those responsible for the conduct of the Society are sorry now they did not pay Mr. Ewen his just dues in the first case without demur, for in addition to his claim there is that very elastic little item —costs!

"OISEAU BLEU."

FLIGHT

FOREIGN AVIATION NEWS.

The Michelin Target Prizes.

FOR this year the Michelin target competitions will be two in number, one for six prizes aggregating 50,000 francs, the first prize being of 30,000 francs, while the other contest will be for four prizes totalling 25,000 francs. Both competitions close on September 15th next. In the first, the competitors will have to drop, from a height of more than 200 metres, at least 12 out of 15 projectiles, weighing 7·1 kilogs., on to a circular target of 10 metres radius. In the second competition, the entrants will have to carry up five projectiles weighing 22 kilogs., and drop them from a height of 1,000 metres on to a target of 25 metres radius. To secure the prize of 15,000 francs at least two shots must find the target. For both tests the projectiles will be provided by the Aero Club of France, and no others may be used.

Promotion for Col. Hirschauer.

AMONG the promotions recently announced by the French Minister, probably none has given such general satisfaction as that of the elevation of Col. Hirschauer to the rank of Brigadier-General. It is recognised that since he succeeded General Roques as Permanent Inspector of Military Aeronautics, General Hirschauer has done splendid work on behalf of military aeronautics in France.

A Volunteer Corps for France.

FOLLOWING the announcement that a scheme is afoot in Germany for the formation of an aerial aviation corps comes the news of a similar movement in France. It is proposed that the State should pay a subsidy of 5,000 francs to a certificated aviator possessing his own machine, or 3,000 francs to a pilot not owning a machine; and a pilot not holding a superior *brevet* should be assisted by the State to obtain this qualification. Each volunteer would be required to undergo a month's training each year for which he would be paid according to his rank.

An Unusual Accident.

NAVAL LIEUT. BERODE met his death in a peculiar way at Remiremont. On December 31st, after making a flight with Lieut. Coville, as he was descending from his machine he was struck by the propeller and sustained such injuries that he died on the following day.

Cross-country on Deperdussin Hydro.

LAURENS, on Monday, accompanied by Jacques Schneider, flew from Triel to Nantes on a Belgian-built Deperdussin hydro-aeroplane. On the 1st inst., Laurens started from Triel, and flying over Vernon landed at Rolleboise, near Bonnieres, for lunch. He returned to Triel in the evening, having covered over 100 kiloms.

Fast Flying on a Caudron.

ON a Caudron machine, with a 45-h.p. Anzani motor, Bosano started from Issy at 3.30 on Monday afternoon, and a quarter of an hour later landed just by Compiegne.

Tabuteau Gives up Flying.

AFTER meeting with considerable success at piloting either monoplane or biplane, Tabuteau has decided to give up aviation. He has taken up the agency for the Alda Motor Car, with which he intends to compete in the more important automobile competitions.

More Farmans for Belgium.

TWO dozen Farman biplanes have been ordered by the Belgium Army, eight of which are to be stationed at Namur and eight others at Liege. In each of these centres it is proposed to quarter a staff of 31 aviators and mechanics.

More Borel Superior Pilots.

ON December 31st, Sergeant Pinsard completed his tests for a military *brevet* on his Borel monoplane over a course from Buc to Pont-Leroy and back, and Lieut. Personne made his first test from Buc to La Chatre and back. The latter pilot made his last test on Monday, completing a round trip of 300 kiloms. in just under three hours.

Cross-Country by Legagneux.

ON his Morane monoplane, Legagneux, on December 30th, flew from his flying ground at Corbeaulieu near Compiegne to Beauvais and Amiens, and back to Compiegne.

Touring on a Blériot.

BARON PASQUIER made another of his fine cross-country trips on his Blériot on the 31st ult. Starting from Buc at 11 a.m., he steered a north-westerly course and at 2 o'clock safely landed at Dieppe.

A Quick-Firer on a Blériot.

AFTER carrying out some tests at Buc on the 31st ult. with the new Blériot "Canard," Perreyon changed over to a tandem Blériot which has been equipped with a quick-firing gun, and at one time he had the machine up to an altitude of 5,000 metres.

A New Clement-Bayard Monoplane.

GUILLAUX has recently been testing at Issy a new Clement-Bayard monoplane which has given very good results. It is very light and is fitted with a 50-h.p. Gnome motor. The machine gets away very quickly, while the modifications which have been made in the landing chassis have proved a distinct success.

Good Flying at Buc on Farmans.

ON New Year's Day, at Buc, Non-commissioned Officers Marc and Corbeil each made trips of an hour and a-half on Farman machines at altitudes varying between 800 and 1,000 metres, while van Steyn also made a long flight at 1,200 metres. On the 3rd Minier made a trial of over an hour's duration, and on Saturday Legras was up for half an hour. Maurice Farman went over to Etampes with Senouque, and in the afternoon returned with the Marquis de Larienty-Tholozan as passenger.

A New Aviette Prize.

M. BERNARD DUBOS has placed a prize of £40 at the disposal of the Aero Club of France, to be devoted to a competition for bicycles fitted with flapping wings. After the initial jump, the machine must cover a distance of 1 kilom. by the aid of the flapping wings only.

Captain Clavenad Reinstated.

IT is announced that Capt. Clavenad, against whom disciplinary measures were enforced by the French military authorities some time ago for publishing an article criticising the action of the French War Office, has, no doubt having purged his contempt, been reinstated. After a short period of practice he will proceed to the command of the aviation centre at Mezieres.

Helen Proposes a Long Trip.

HELEN, the well-known Nieuport pilot, is planning a long trip from the South of France, through Spain and Algiers to Tunis. Starting from Montpellier his proposed route is *via* Perpignan, Barcelone, Tortosa, Valence, Alicante, Carthagène, Almeria, Malaga, Tetouan, Mahila, Oran and Algiers.

Helen Distributes Bouquets.

ON New Year's Day, Helen took the opportunity of making a tour round Paris on his Nieuport monoplane, dropping bouquets of flowers to prominent people on the way. Among those so favoured were M. Deutsche (de la Meurthe), M. Lepine, the chief of police, and the Mayor of Boulogne.

Another Englishman Takes his Ticket in France.

LIEUT. HARVEY, after a very short period of instruction at the Etampes school, passed the tests for his certificate on a Farman biplane on New Year's Day.

Buc–Verdun in Good Time.

ON a Maurice Farman biplane, and accompanied by a passenger, Lieut. Manges Devarenne started from Buc at 10.30 a.m. on the 3rd inst., and landed safely at Verdun at 12.50 p.m., the course being steered above the clouds by the aid of a compass.

Comte de Lambert and Hydros.

FOR some time Comte de Lambert has been giving a good deal of attention to hydro-aeroplanes, and with his latest machine several trials were made over the Seine at Triel last Saturday. In one trial the machine was taken to just by Meulan and back, and in the afternoon Comte Lambert gave several of his friends brief trips on it.

A Ten-seated Voisin Hydro.

COLLIEX, the well-known Voisin pilot, is busy with the construction of a hydro-aeroplane intended for the transport of ten passengers. The machine consists of two Voisin *cellules* of 25 metres span, mounted on one coque, and the motive power will be two 200-h.p. motors coupled together and driving one propeller.

A Hydro-Aeroplane Fatality.

AFTER making a fine trip on his Nieuport hydro-aeroplane from Meulan to Honfleur, on the 2nd inst., Levasseur the next day continued on his way along the coast. He attempted to alight on the sea at Fecamp, but while turning his machine was caught in an eddy and capsized. The pilot was rescued but his mechanic, Mallet, was drowned.

German Passenger Records.

ON an Aviatik military biplane, Faller has been making some remarkable passenger records at Mulhausen recently. On the 2nd inst., he flew with four passengers for 1 hr. 18 mins., while on the following day he took five passengers, the total live load being 924 lbs., for 1 hr. 6 mins. 5 secs., and on Saturday he carried seven passengers for 6 mins. 49 secs., the combined weight of the eight people being 1,242 lbs.

The Upper Rhine Circuit.

AT a conference of aero clubs of South Germany, at Cologne, recently, it was decided to again organise an Upper Rhine circuit, but this year it will commence at Wiesbaden and finish at Constance. The date proposed is from May 10th to 19th, and it is suggested it should be followed by a meeting for hydro-aeroplanes on Lake Constance. On condition that the competing machines are exhibited to the public on the evening before the start, the Mayor of Wiesbaden has promised a contribution of £1,000 from the city funds.

No Flying over German Palaces.

AN appeal has been issued by the management of the Johannisthal flying ground to all aviators not to fly over the Royal Palaces at any rate while members of the Imperial Family are in residence. This action is said to result from the flight made by Hanuschke last October when he flew over Potsdam and dropped a laurel wreath bearing greetings to the German Empress on her birthday. While appreciating the compliment Her Majesty was very anxious for the safety of the pilot on account of the high wind blowing at the time.

New German Stations.

THE new German aviation centres at Konigsberg and Posen are to commence work in the middle of next month. The hangars which have been put up are very large, and have been arranged to accommodate not only the aeroplanes but also the lorries and motor cars which are to attend them. At the Doeberitz camp, special barracks are being erected for the accommodation of 32 flying officers.

Hirth Changes to a Biplane.

HELLMUTH HIRTH, who ha sdone such splend'd flying on the Rumpler-Taube monoplane, has now joined the German Albatross firm. As he will in future be piloting a biplane, he made the necessary tests to obtain a *brevet* with this type of machine at Johannisthal on December 24th.

Developments in Italian Military Aviation.

THE Italian Minister of War, General Spingardi, has decided to have the headquarters of military aeronautics at Turin. In addition to the military aviation centres at Mirafiori, San Maurizio and Venaria, it has been decided to establish another at Lamamora. A works for dirigibles is to be arranged in the neighbourhood of Turin. On January 1st some fifty officers leaving the Polytechnic commenced a special course of instruction in aviation. The national fund has reached £200,000, all of which is to be spent on the purchase of aeroplanes.

Russian Frontier Restrictions.

REGULATIONS have been drawn up by the Russian Government strictly forbidding foreign flying machines or dirigibles to pass over the frontiers. Should any aircraft accidently pass over Russian ground, it must be landed as soon as a red flag is waved or a red light shown. Otherwise the frontier guards have instructions to use ball cartridge.

Russian Military Aviation.

WITHIN the past week the Russian military pilots Orloff Sergneieff, Konovaloff, and Tkatcheff flew from Sebastopol to Katcha *via* Simferspol, Bachtchisaria, and Eupatoria.

Danish-Swedish-German Flight.

AT a conference of representatives from the aero clubs of Denmark, Sweden, and Germany, held at Copenhagen on December 30th, it was decided to proceed with the organisation of a race between Copenhagen, Berlin, and Stockholm. The event will probably be held at the end of June.

Flying in Morocco.

ON December 31st Lieut. Reimbert and Lieut. Cheutin, each on a 80-h.p. Farman, and accompanied by a fellow officer, started from Biskra for Touggourt. Cheutin covered the 220 kiloms without a stop in 1 hr. 50 mins., but Reimbert had to descend at M'Raier owing to trouble with his oil tank and was brought down a second time at Djamaa with a seized piston.

⊛ ⊛

AERONAUTICAL SOCIETY OF GREAT BRITAIN.

Official Notices.

Meetings.—The fourth meeting of the Society for the present session will be held on Wednesday, January 15th, at 8.30 p.m., at the Royal United Service Institution, Whitehall, when Professor W. C. Unwin, F.R.S., will preside. Mr. F. Handley Page, A.F.Ae.S., will read a paper, to be followed by a discussion on "The Comparison of Monoplanes and Biplanes, with special reference to the Stresses in each type."

The fifth meeting will be held on Wednesday, January 29th, at 8.30 p.m., when Brigadier-Gen. D. Henderson, D.S.O., C.B., will preside. Mr. Mervyn O'Gorman, M.I.M.E., A.F.Ae.S., will read a paper, followed by a discussion, on "Stability Devices for Aeroplanes."

Council.—Major F. H. Sykes and Mr. W. O. Manning have been co-opted under rule 14, to fill the vacancies on the Council caused by the retirement therefrom of Major A. D. Carden and the present secretary.

Council Election.—Members are reminded that under the rules, nominations of candidates for election to the Council must be received by the Secretary not later than March 5th, signed by two voters and no more, with an intimation in writing by the nominees that they are willing to serve.

BERTRAM G. COOPER, Secretary.

Long Hydro Trip in America.

ON a Benoist hydro-biplane, Antony Jannus successfully completed his voyage from Omaha to New Orleans, a distance of 1,859 miles on December 14th. He started from Omaha, in Nebraska, on November 6th, and followed the rivers Missouri and Mississippi, stopping at various places on the way to give exhibition flights, of which 42 were made. His machine was fitted with a 75-h.p. Roberts motor. During the greater part of the trip a passenger was carried who took cinematograph views of the interesting scenes on the journey.

Another Fine Argentine Flight.

ON January 6th, Mr. George Newberry flew on his Blériot from Buenos Aires along the Rio de la Plata to Monte Video, the trip taking 2 hrs. and 40 mins. Herr Labbe was a passenger on the machine.

Paillette Engaged by Uruguay.

AFTER having done some excellent flying in Argentina, &c., the French pilot, Paillette, has been engaged by the military authorities of Uruguay to instruct officers in flying.

Flying in Ceylon.

DURING the second week in December some very good flying was seen on the Colombo Racecourse, the exponents being Marc Pourpe and George Verminck, both using Blériot monoplanes. On December 7th two flights were made before a few specially invited guests. Pourpe was the first up and made a circuit of the ground, after which Verminck took the air and made a slightly longer trip. The first public exhibition was on Tuesday, December 10th, when three flights were made. A crowd of about 2,000 people assembled on the racecourse, and Pourpe was first away. After keeping above the course for the first round, he ventured outside for the second circuit and made a wide sweep over the country before landing. A somewhat similar flight was made by Verminck, after which Pourpe did some fancy work. On the following day, as there was but a small attendance, there was only one flight, but during a fourteen minute trip Pourpe ventured over the fort and harbour.

⊛ ⊛ ⊛ ⊛

AIRSHIP NEWS.

Prince Henry on L1.

ON the 3rd inst., Prince Henry of Prussia paid a visit to Johannisthal, and after inspecting the engines which are taking part in the competition on the 27th inst., for the Emperor's prize, he went for a trip in the naval Zeppelin L1. This dirigible and the "Hansa," which is now stationed at Potsdam, are now cruising almost daily over Berlin, the naval authorities being anxious to have as many trained officers and men as possible so as to man the new Zeppelin cruiser which is now nearing completion.

A Cruise by Dupuy de Lome.

THE dirigible Dupuy de Lome made a cruise of an hour and a half on January 2nd at Maubeuge, having on board General Desaleux. The following day she was cruising over Avesnes and Landrecies.

Parseval for Farnborough.

IT is understood that the new Parseval airship ordered by the Admiralty, at a cost of £25,000, will be stationed at Farnborough.

More Dirigibles for Russia.

HAVING decided to secure a fleet of 20 dirigibles before the end of the year the Russian Government has ordered two airships in France, one in Germany and three from Russian firms, all being of the semi-rigid type.

French Balloonists Arrested in Germany.

ON the 18th ult., a balloon, piloted by M. de Francia, which had left Paris, landed at Schernebeck, and the passengers, one English and two Frenchmen, were arrested on landing. They were, however, subsequently released upon the intervention of the German Aero Club.

⊛ ⊛

FLIGHT

AERONAUTICAL ENGINES.

Paper read by A. GRAHAM CLARK before the Institution of Automobile Engineers.

(*Continued from page* 21.)

The Austro-Daimler Engine of 120-h.p. is shown in Figs. 5 and 6, from which it will be seen that it somewhat resembles the conventional car engine, as do also the 45, 65 and 90-h.p. engines. A single rod operates a rocking lever placed over each cylinder for actuating the valves, and is therefore subjected alternately to tension and compression. To the engine illustrated, two magnetos and two carburettors are fitted, so that in the event of the failure of one of the former, the other will keep the engine in action; while when two carburettors are employed, the probability of both becoming defective is not so great, and hence a safe descent can be made under power. From the shape of the combustion chamber, the author would not anticipate that any increase of power is likely to be obtained from having two sparks in the one cylinder. The fitting of helical springs to the valves would probably be preferable to the laminated springs which are now employed, on account of the lag due to the friction between the leaves, especially since the force required to operate the valve gear of this type must be great.

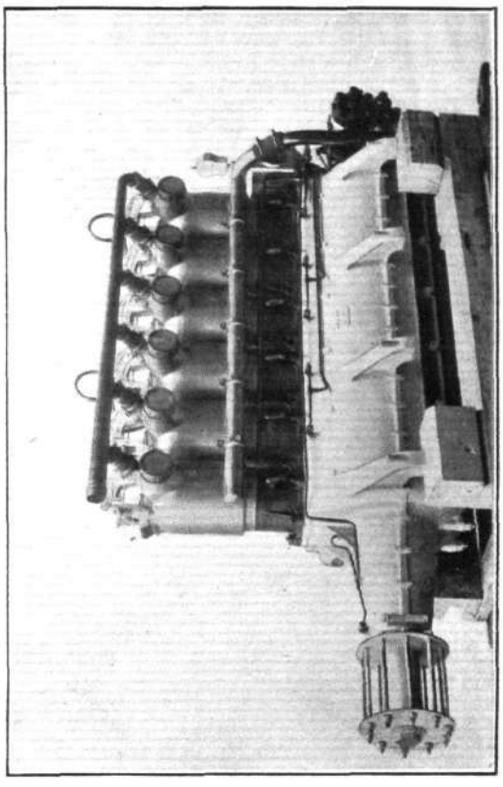


Fig. 6.—120-h.p. Austro-Daimler Engine.

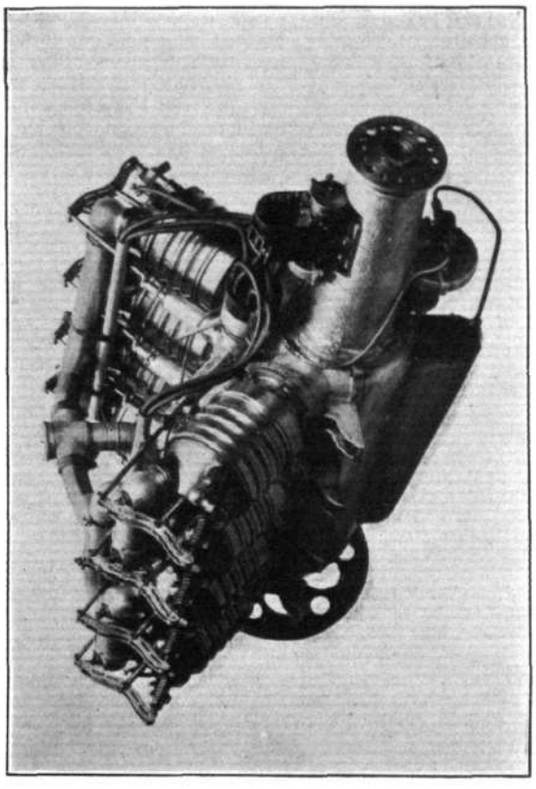


Fig. 8.—80-h.p. Dorman Engine.

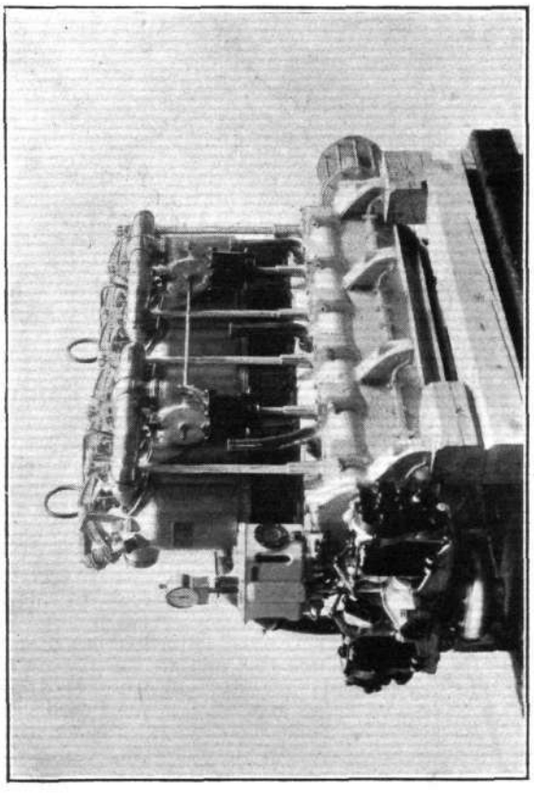


Fig. 5.—120-h.p. Austro-Daimler Engine.

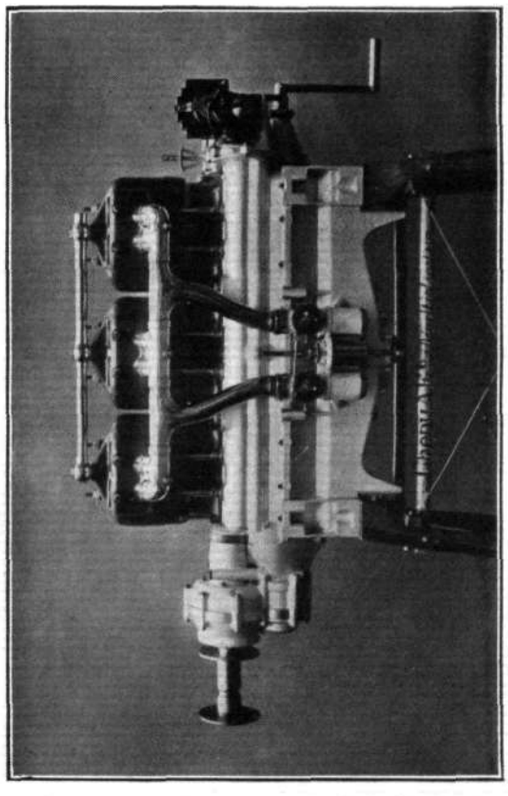


Fig. 7.—70-h.p. Chenu Engine.

Chenu Engines. — The 70-h.p. engine is illustrated in Fig. 7, and is supplied with or without the reducing gear shown in the figure.

It will be observed that the suspension is from the bottom half of the crank-case. The compression pressure used in these engines is not known, but it is presumably high, having regard to the brake mean effective pressure and thermal efficiency obtained during tests carried out in the laboratories of the Automobile Club of France and the Conservatoire des Arts et Métiers, while the oil consumption is very low.

In the **Curtiss Engines**, a peculiar construction is adopted for the exhaust valve. This has a cast-iron head which is reinforced by a perforated steel disc embedded therein, the whole being electrically welded to the carbon steel stem. In the two smaller models, the connecting rod ends dip into a sheet metal trough, but this form of splash is supplemented by oil which is ejected from radial holes in the hollow cam-shaft on to the rods. Bosch dual ignition is fitted to the two larger engines.

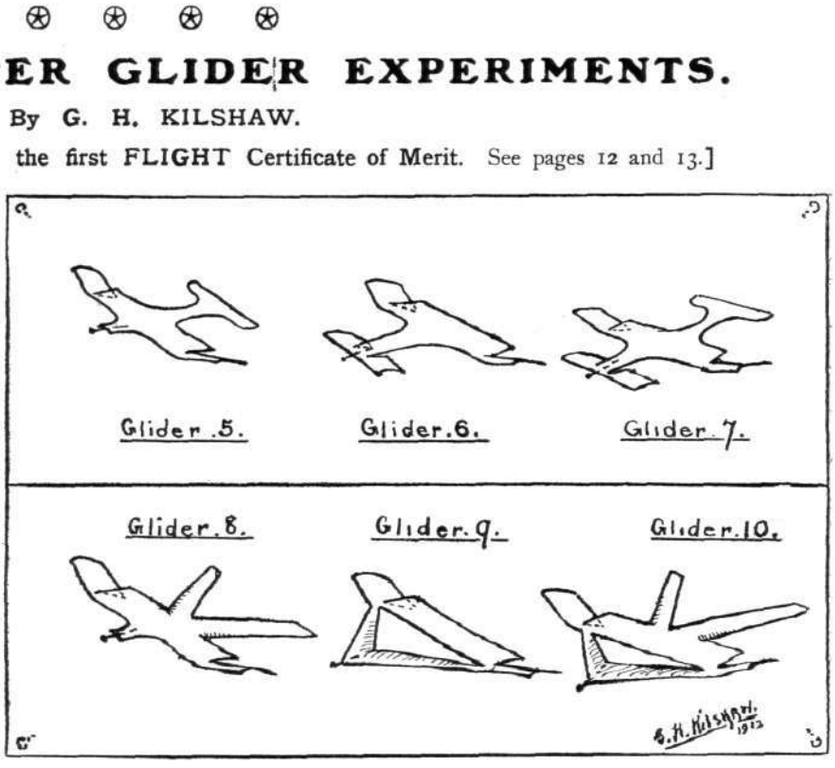
The Dorman 80-h.p. Engine is shown in Fig. 8, and the feature which calls for special mention is the method of cooling the crank-case and bearings, and the exhaust from the engine. For the former, a bell-mouthed orifice covered with gauze is formed upon the bottom half of the crank-case, which opens above into the interior. To the upper half a connection is made with the carburettor inlet, so that the air taken by the engine must first pass through the crank-case. It will be clear that such an arrangement will conduce greatly to the cooling of the oil and the bearings and result in the more efficient lubrication of these parts, while it will be attended with practically no harmful effects, having regard to the conditions under which the engine is intended to be employed. Judging from the satisfactory operation of similar systems in other classes of work, no trouble is to be anticipated from the carrying over of oil in suspension into the cylinders.

Respecting the method of expelling the exhaust from the cylinder, the greater volume will naturally be ejected through the auxiliary exhaust formed by a number of small holes opening into an extension of the water jacket, at the bottom of the cylinder, while the exhaust valve fitted in the head, opening later, will release the remainder. But it would seem to be preferable for the gases emitted through the latter to pass through an aperture in the side of the valve cage rather than over the valve spring as at present, since they may be at a sufficiently high temperature to affect the spring detrimentally.

The engine has flat seated valves and a non-stop carburettor.

The cylinders are mounted exactly opposite each other so that in order to avoid the use of offset or forked connecting rods, one piston of each pair has two rods attaching it to the crank-shaft.

(To be continued.)



NOTES ON PAPER GLIDER EXPERIMENTS.

By G. H. KILSHAW.

[This contribution has been awarded the first FLIGHT Certificate of Merit. See pages 12 and 13.**]**

PART II.—Nose-Diving and Design.

CONTINUATION of the previous experiments on stability, and the diving tendency during some of the tests, the following is the result of experiments with paper gliders of well-known types and combinations:

There may be said to be only four distinct types of aeroplane at present flown with success, mainly as follows: elevator in front type, tail behind type, elevator in front and tail behind, and the Dunne or back-swept wing type. As a result of the previous stability experiments, and my desire to keep to the dihedral and increased angle of incidence wing tips, it will be seen to be impossible to include this latter in the tests without extensive alterations, whereby changing the real characteristic of this type. The principle has, however, been combined with the three other types, and with results of no little interest.

The sketches show the various gliders, a series of six. Gliders 5 and 6 had a wing span of 6 ins., and a fore and aft length of 5½ ins. Glider 7 being as 5, with the addition of an elevator in front, increasing the length to 7½ ins. Gliders 8, 9 and 10 are of similar types to the above with the tail and elevators made to sweep back as the Dunne method, with span and length as the gliders 5, 6 and 7 respectively.

The following table of tests and results has been made out to enable easier comparison, and the inclusion of the glides should give a clearer idea of their actions. It may be mentioned that the glides given are the best obtained:—

No. of Glider.	Test I. Launched at angle of 45° to left wing.	Test II. Released with wings vertical.	Test III. Launched upside down.	Best glide when launched 4 ft. high.
5	Steady glide to left of 10 ft.	Nose-dive, landed in 4 ft.	Sharp dive landed in 3 ft.	12 ft.
6	Steady glide to left of 10½ ft.	Quick recovery, and glide of 7 ft.	Quick recovery, and glide of 9 ft.	13 ft.
7	Glide to left of 11 ft.	Slight dive, followed by glide of 6 ft.	Slight nose-dive and good glide of 11½ ft.	12 ft.
8	Steady glide to left of 14 ft.	Slight nose-dive, then glide of 8 ft.	Excellent recovery, and glide of 13½ ft.	16 ft.
9	Steady left glide of 13 ft.	Slight dive, and glide of 8 ft.	Quick recovery, and glide of 10 ft.	15½ ft.
10	Steady glide to left of 11 ft.	Quick recovery, and glide of 7½ ft.	Smart recovery, and glide of 9 ft.	14 ft.

Prior to a study of the results, I should like to add that, before sufficient satisfaction was obtained to proceed to record their actions, three sets of gliders were tried. The last were given dihedral angles of about 10°, and incidence angles of 5° at their wing tips, while the tails of 8 and 10 were set back to form an angle of 50°, and the elevators of 9 and 10 to an angle of 60°. The elevators of those so fitted were given a slightly larger angle of incidence than the wing tips, tail planes being left flat with the bodies, giving the machines a stable fore and aft vee.

Test III, although severe, perhaps, is a position in which a full-size machine may, and has been in, through being overturned, and it is only by instituting such that the reliability of design may be thoroughly tested. All but glider 5 did fairly well in this test, only a very slight dive being discernible in glider 7. The general action being a down and under movement until righted and then a glide in direction reverse to that launched.

While showing an improvement when as a tail plane, the back-swept plane seemed not as good when fitted as an elevator, comparing gliders 6 and 9, Test II. This may be caused by the action of the air flowing back along these surfaces and under the main plane, and probably increased speed that happens during a nose-dive increasing this to such an extent that the resulting lift on the main plane being magnified in excess of that on the elevator, the centre of pressure moving back, causing the front to dive. The ordinary type of elevator in front seems to decrease the nose-dive as the results of gliders 6 and 7 seem to indicate.

The gliding angles of the gliders 8, 9, and 10, especially 8, were improved after the addition of the back-set planes, and the marked improvement of the fore and aft stability of glider 8 over 5 gives good illustration of the fine steadying effect of this type of design.

The outstanding excellence of the loaded elevator in front over the non-lifting tail behind is interesting, glider 6 giving the best results, followed closely by glider 10.

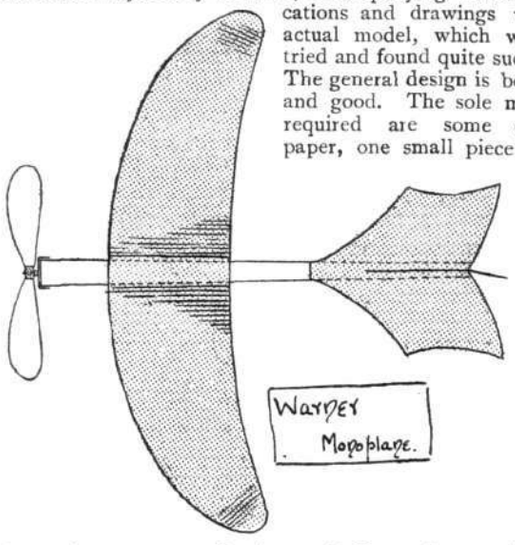
Before closing this article, I should like to state that each glider was tested at least six times in each test to ensure accuracy, which is necessary in a research of this nature.

Models

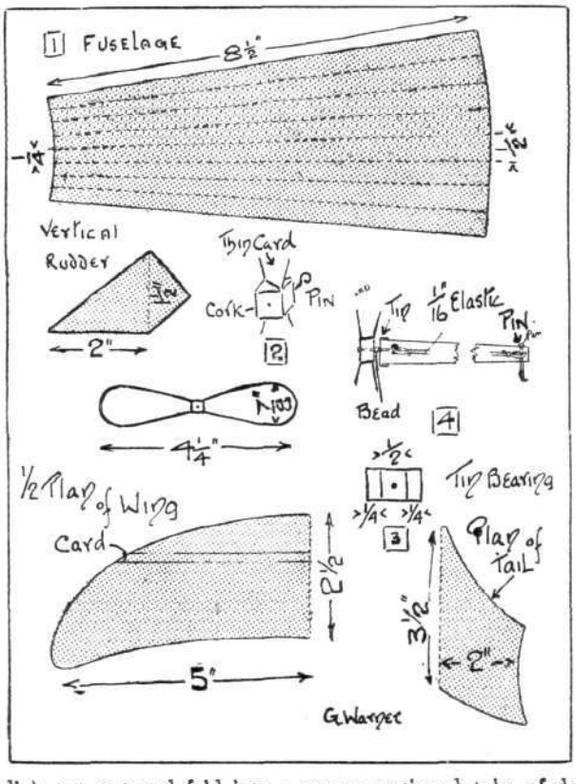
Edited by V. E. JOHNSON, M.A.

A Paper Tractor Monoplane.

A CORRESPONDENT, Mr. G. Warner, sends us the following particulars about a little tractor monoplane constructed of paper, suitable for flying indoors, which can be constructed in a few minutes from materials always ready to hand; accompanying the communications and drawings was an actual model, which we have tried and found quite successful. The general design is both neat and good. The sole materials required are some drawing paper, one small piece of tin



½ in. by 1 in., some small pieces of thin cord, two pins (one rather long), one small piece of cork (¼ in. cube), one small glass bead for the propeller-shaft bearing, 10 ins. of $\frac{1}{16}$ in. square sectioned rubber, some gum or glue, &c. First of all mark out the *fuselage* on the drawing paper, as shown in Fig. 1, and run down the lines with the head of a needle (or a knitting



needle), cut out and fold into a square sectioned tube of double thickness, gum or glue together and leave to dry. This forms a strong *fuselage* 8½ ins. long, ½ in. square at one end, tapering to a ¼ in. at the other. Next make the propeller (tractor) as follows: Take the piece of cork (previously cut to the required sized cube) and cut two diagonal slits, as shown in Fig. 2, and insert two pieces of thin card to form the propeller-blades, of the shape shown in the illustration. Stick a rather long pin through the centre of the cork, and coat all with an adhesive or quick-drying varnish to strengthen it. The pin should be of sufficient length to enable the head to be bent over into the cork, so that it cannot possibly slip. The two blades should preferably be slightly bent or cambered. The bearing is made out of a piece of thin tin (see Fig. 3), bent at the dotted lines at right angles, so as just to fit over the larger end of the tubular *fuselage*. The planes should next be made—a good shape to make them is shown in the illustrations, although the reader can try others if he so chooses. In any case, the main plane should be strengthened with a strip of thin card, placed transversely across the plane. The rubber should be fastened, as shown in Fig. 4, to the pin stuck through the thin end of the *fuselage* and bend over to form the skid. The rudder, or vertical fin, and the tail should be of the dimensions shown in the illustrations. The distance of the leading edge of the main plane from the larger or front edge of the *fuselage* should be about 1¼ ins. Quite a number of interesting experiments showing the effects of wing warping, &c., can be performed with such a model. Remember the model flies propeller *first*, and wind up the propeller in such a manner that *when running down* the column of air formed by it, is driven backwards, *i.e.*, towards the tail. By trying the model first of all without a vertical fin, and then with it, the stabilising action of the latter is well shown.

Mr. Temperley's Query.

Referring to our issue of December 21st last, we have also received the following communication from Mr. L. L. Vigers in which he gives the following particulars which he trusts will be of use to readers of FLIGHT. Mr. Vigers states that his models are purely of an experimental character, and not built with the express intention of securing either long duration or distance flights, nor does he regard his wing surfaces as specially efficient, since the following data represent what has proved successful in a more or less inefficient model—such should be more than ample for an efficient one:—

Machine No.	Span.	Chord.	Effective area.	Total weight.	Weight of rubber.	Diam. of propeller.
	in.	in.	sq. in.	oz.	oz.	
18	52	10	500	16	?	12-in. Bonn
19	54	10	420	15·25	3	12-in. Bonn
20	54	9	468	16·5	3	14-in. Normale
21	Not a successful machine					
22	54	10	520	17	3	14-in. Normale

In each case the effective area is the area of the main planes—the tail being flat and acting as a combined tail and elevator carries no appreciable load. This tail area should be about one-sixth the area of the main planes. The rubber used was Bonn's strip. The discrepancy betweeen the product span × chord and effective area is due to the gap between the two main planes and body and to allow the rubber to pass between the planes. The following deductions are certain only for 19, 20 and 22, since Mr. Vigers is not sure of the measurements given for 18:—

Machine No.	Area per oz.	Total weight per sq. in.	Rubber weight per sq. in.	Surface to 1 in. diam. of propeller.	Weight of machine to 1 oz. of rubber	Area to 1 oz. of rubber.
	sq. in.	oz.		sq. in.	oz.	sq. in.
19	32·1	·031	612×10^{-5}	40·8	5·05	163
18	31·2	·032	—	41·6	—	—
20	28·4	·035	642×10^{-5}	33·5	5·5	156
22	31·3	·032	578×10^{-5}	37·1	5·66	173
Mean is of 19, 20, and 22... ...	30·6	·0326	610×10^{-5}	37·1	5·4	164

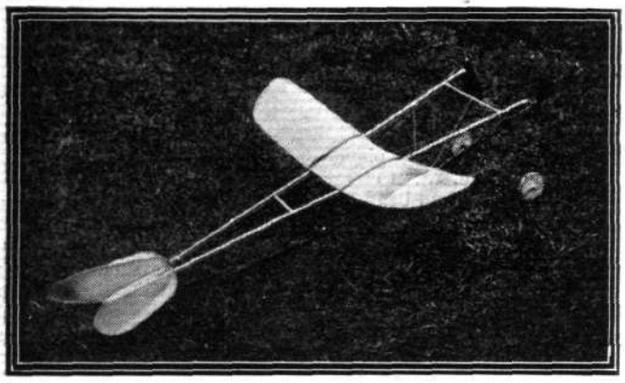
Numbers 19, 20 and 22 were the most successful machines. Photos of the machines are enclosed. [Unfortunately these are not sufficiently clear to bear reproduction.]

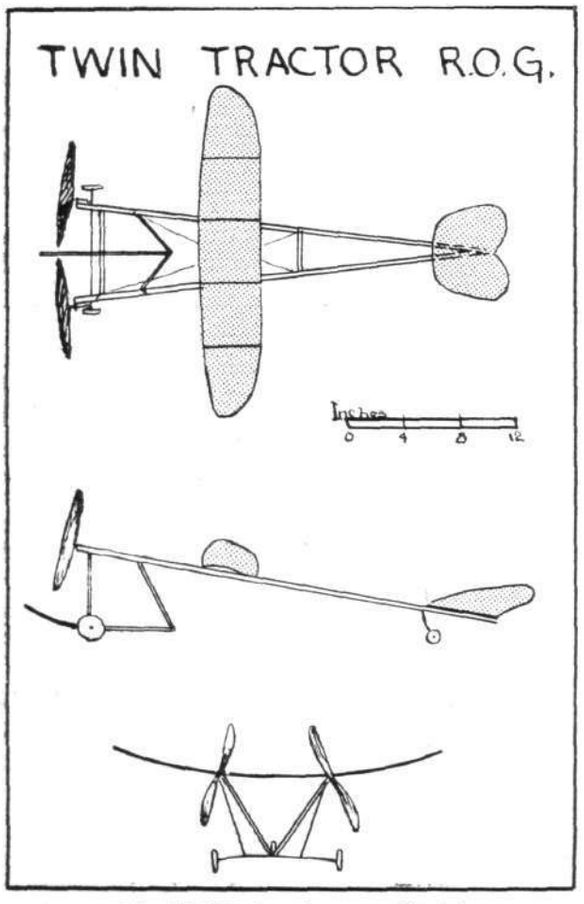
A Hydroplane Challenge.

Mr. F. A. Mills, of 28, Mornington Road, N.W., forwards us the following :—"I notice a statement in your issue of December 21st last that a ½-h.p. 4-ft. petrol-driven hydroplane—illustrated—has attained a speed of 14 m.p.h. As the owner of the fastest *officially* timed petrol-driven hydroplane, I hereby challenge the owner (or runner) of the above 14 m.p.h. boat to a race against my 1-metre petrol hydroplane, 'Stentor Minor,' *any* distance up to two miles for £5 a side. To be run anywhere within a London radius of 15 miles."

Mr. W. H. Amo's Twin-Tractor R.O.G. Model.

The *fuselage* of this machine (the writer's twenty-fifth model) is of channel-shaped silver spruce, the main plane of 18-gauge steel wire





Mr. W. H. Amo's r.o.g. Model.

covered with Jap silk, varnished after it was put on. The camber of the two centre ribs ⅜ in., the other ¼ in. The tail and fin are made of 20-gauge steel wire ; the former has a negative angle of 1 in 36, and the latter an area of 10 sq. ins. (approx.). The last-named is, however, too large, and will be altered in my next machine. The propellers, carved from the solid, are 8-in. diameter, and have a pitch of 14·5 ins., the width of the blades at the widest part being 1·25 ins. The motive power is ten strands of $\frac{1}{16}$-in. square section rubber to each propeller—650 turns were given and on a bench test they ran down in 30 secs. Best flight, 25 secs. (approx.) ; duration and distance, 135 yards after rising from the ground. The weight of the machine is 5 ozs., which the designer considers rather heavy. No doubt the weight could be cut down by using three Clarke's wheels instead of the one at the tail, and two 2-in. hollow cardboard ones in front. As the machine has to rise off very rough ground large wheels are a necessity.

Scientific Model Building.

V. Propellers, their Design and Construction.

Dynamic Thrust.—In the case of a propeller the thrust is equal to :—*Weight of mass of air acted on per second* × *by slip velocity in feet per second.* When the machine, and therefore the propeller is advancing through the air (rotating of course at the same time) it might be thought that the thrust would be less. Sir Hiram Maxim found, however, experimentally, that the thrust of a propeller travelling through the air at a speed of 40 m.p.h. fell but little, the r.p.m. being of course the same, *i.e.*, provided the slip speed was not greater than from 60 to 70 per cent. of the theoretical speed. The explanation is that when travelling, the propeller is constantly advancing on to undisturbed or fresh air—the slip velocity is reduced —the undisturbed air being equivalent to acting upon a larger mass of air.

Theoretical Pitch.

In the case of a theoretically correct propeller the pitch should at all points be the same. If we therefore take a point nearer to the centre or boss than the blade tips, the angle at that point must obviously be greater in order to obtain the same pitch with a shorter base line. At the very centre of the propeller the blade must clearly be at right angles to the plane of rotation. It is often contended that those portions of the blades near the boss do very little or no work, there is no doubt that this is more or less true, but it is certainly of primary importance that they should be so constructed as to offer no, or at any rate the minimum assistance, in the line of travel. If we cut away the inner portions of the blade, then we are driving back a *tube* of air, whereas what we should be driving back is a *cylinder* of air which suffers loss of efficiency, *i.e.*, which is acted upon by air friction on its outside only, and not as in the former case, *both* inside and outside.

If the pitch be not uniform, then there must be some portions of the blade which will drag through the air instead of affording useful thrust, and others which will be doing more than they ought, *i.e.*, put air in motion which had better be left quiet.

Pitch Coefficient or Pitch Ratio.

If we divide the pitch of a screw by its diameter, we obtain what is known as pitch coefficient or ratio. The mean value of eighteen pitch coefficient of full-sized machines worked out by the writer some time ago came out at 0·62. In the case of the original Wright machine it was (probably) 1. It was, of course, a slow-speed propeller, about 450 r.p.m., and its efficiency was admitted on all hands. In marine propulsion this ratio is generally 1·3 for a slow-speed propeller, decreasing to 0·9 for a high-speed one. In the case of rubber-driven models, this pitch ratio is often carried much higher, even to over 3, 3½ being not unfrequent with a tip angle of some 45°. Within limits it would appear the higher the pitch ratio the better the efficiency. The higher the pitch the slower the r.p.m. In the case of rubber-driven models we do not want the rubber to untwist (run out) too quickly, which a fine pitch propeller tends to make it do, consequently one generally finds in models built for duration or distance that a propeller of large pitch ratio is employed. In the case of power-driven models, the engine to work efficiently must revolve quickly ; one is therefore either compelled to use a fine pitch propeller, which is not efficient when revolving under 1,000 r.p.m., or one must gear down to a slow speed propeller. Now gearing always represents loss of energy, inadmissible, at any rate, in a small power-driven model, thus one finds fine pitch propellers invariably employed in this case. Intimately connected with the pitch ratio is, however, the blade area and—

The diameter.—If we increase the diameter we shall obviously decrease the pitch ratio. From experiments which the writer has made with power-driven models during the last twelve months, he is certainly an advocate of propellers of large diameter for this type of model at any rate. The best results I have obtained in this case have invariably been with narrow bladed propellers of (proportionately) large diameter. It is certainly of primary importance to engage as much air as possible. The Wrights on their machine (their propeller diameter was 8·5 ft.) engaged from six to seven times more air per h.p. than the early Farmans. Prior to this the Wright Brothers had been able with an engine developing on 14-h.p. to fly with a passenger—the ratio *re* air engaged : to that engaged on the Farman machine in this case being 10·5 : 1. The efficiency referred to is, of course, efficiency as regards weight carried per horse-power.

(*To be continued.*)

KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

British Model Records.

Hand-launched ...	Distance	A. E. Woollard	...	477 yards.
	Duration	A. F. Houlberg	...	89 secs.
Off ground	Distance	G. Rowlands...	...	232 yards.
	Duration	A. F. Houlberg	...	51 secs.
Hydro, off water ...	Duration	G. P. Bragg-Smith	...	25 secs.
Single-tractor screw, hand-launched ...	Distance	H. R. Weston	...	84 yards.
	Duration	F. W. Jannaway	...	22 secs.

International Aero Exhibition, Olympia, February 14th to 22nd inclusive.—All members and friends who intend exhibiting in the model section should at once inform the hon. sec., stating what class, &c., they intend exhibiting in if they cannot send the official form. This is particularly requested so that space can be reserved for them, and in class 3, viz., *hydroplanes, so that the tank can be proceeded with.* Club secretaries are requested to send in their club's official forms, giving number in each class, though the individual forms, giving details of machines can follow, but all forms should be sent by end of month. The following clubs have applied for club stands which have been reserved for them, viz.: The Aero Models Association (Northern Branch), The Bath and Somerset Aero Club, North-East London Aero Club, Reigate, Redhill and District Aero Club, Leytonstone and District Aero Club, Paddington and District Aero Club, The Windsor Model Aero Club. Any other club wishing to avail themselves of having a stand at the special reduced rate must apply at once.

Annual Subscription Dinner.—It has been suggested that an annual subscription dinner would give a good opportunity of meeting old competitors and fellow workers in aviation, and the hon. sec. would be glad to know if members and friends favour the idea and would be likely to attend. It would be held at a London Hotel on a convenient date in March preferably, say, in the second or third week. It must be understood that it all depends upon the members if one is held or not, although the attendance promised this year suggests that the institution of an annual dinner would meet with success, but unless other members who have no special engagement on then, make an effort to attend on the first occasion, the outlook for future meetings might be gloomy. If the idea is generally taken up, dinners would on future occasions include the officers and men of the War Kite Squadron.

War Kite Squadron.—The appeal for funds for the equipment of the 1st War Kite Squadron does not meet with the success it deserves. Will any wealthy patriotic reader send such a donation as would make it possible for the kite section to be proceeded with at once, for once having got the first section subscriptions for the wireless and gun sections would be forthcoming.

Official Trials.—To-day, Saturday, January 11th, on the grounds of the Aero Models Association (Northern Branch) Finchley, at 3 o'clock.

27, Victory Road, Wimbledon, S.W. W. H. AKEHURST, Hon. Sec.

MODEL CLUB DIARY AND REPORTS.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Aero-Models Assoc. (N. Branch) (15, HIGHGATE AVENUE, N.).
JAN. 11TH. The K. and M.A.A. trials for records at Finchley. All entries for the December trials hold good, and it is hoped that some new records will fall to the lot of this club.

Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).
JAN. 11TH. Lecture on "Meteorology" by the secretary. Jan. 18th. Annual general meeting. Every member should attend for the purpose of electing officers and committee for the ensuing year, receiving the report and balance sheet, and arranging the procedure for the coming season.

Sheffield Model Aero Club (35, PENRHYN ROAD, SHEFFIELD).
JAN. 11TH. Hand-launched "duration" contest, postponed from Jan. 4th, as announced in last week's FLIGHT, at "The Standhouse Aerodrome." Intake 3 o'clock prompt.

S. Eastern Model Ae.C. (1, RAILWAY APPROACH, BROCKLEY).
FLYING at week-end as usual at Kidbrooke, Blackheath, Woolwich, Mitcham, South Norwood, and at Chislehurst (by members of the Chislehurst and District Aero Club).

Yorkshire Ae C. (Model Sec.) (53, WEST STREET, LEEDS).
JAN. 11TH. Woodhouse Moor.

CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

Guns on Aeroplanes.

[1704] In discussing the arming of aeroplanes in your issue of the 7th December, you have fallen into error through being unaware of the fact that it is a commonplace with guns in fixed positions to fit stops limiting elevation and traverse. Had the possibilities you allude to existed, I should not have suggested arming the Cody machine as I did some time back.

Every effort should be made to dispose of struts and stays, so as to give the guns as much play as possible, when designing an armed aeroplane, but stops must be fitted in any case to protect the machine from injury.

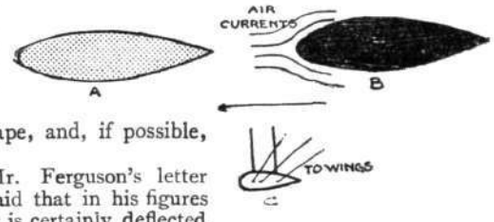
I trust you will publish this, in case any designer should be disturbed in mind by your article. R.A. (Retired).

[The solution of the problem, we think, is not to handicap the gun by fitting stops to suit the limitations of existing machines, but to design aeroplanes on which guns can be used over an angle of, say, 120° or more. Stops would then be no more than a reasonable precaution, and should not sensibly interfere with the effective action of the gunner.—ED.]

Stream-line Bodies.

[1705] Owing to the answers I have received on stream-line bodies, I should like to comment on them, and should be pleased if you would publish the following article in your columns.

Referring to Mr. Macdonald's letter (1680), I was surprised to hear of the shape of the modern Whitehead torpedo, but consider the term blunt nose rather vague, and I shall be pleased if he could furnish me with more particulars of their shape, and, if possible, sketches.



Turning to Mr. Ferguson's letter (1684), I am afraid that in his figures (ii and iv) the air is certainly deflected from its course very much, and also, perhaps, in my Fig. II (1671), but not nearly so pronouncedly. By drawing a figure as his Fig. I, and inserting a slight curve instead of a point (Fig. A), the deflection can be brought to a minimum, and one gets a section as in Fig. B.

I now turn to Mr. F. Robinson's and Mr. Keller's letter (1685), and I am afraid that they wander completely off the point in saying that a pin, according to my argument, ought to have a curved end. Surely they must know that the properties of air are not the same as cloth, for instance, with which a pin comes in contact. They might also know that the bows of battleships are not a sharp point, as it were, but slightly curved. They furthermore say it has been proved that a pointed front offers less resistance in water. I think they would do well to look at Mr. Macdonald's letter (1671), and if they do not believe his statements, they will, no doubt, after careful investigation, find that he is correct. To finish up, how do they account for the shape of the Deperdussin monocoque, the end of the warping lever on the Bristol, as in C, the Breguet wing struts, and the shape of the fuselage of the armoured Borel and Breguet, not to mention many other examples.

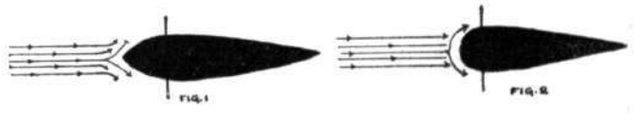
W. Folkestone. M. ROBINSON.

[1706] The subject of stream-line bodies raised by Mr. M. L. Robinson (1671) is certainly very interesting, especially as there seems such a diversity of opinion.

I should like to state that I am in favour of the blunt or spherical head, and not the pointed or cone-shaped, for reasons which seem to me obvious.

If we draw a perpendicular line through the widest part of the body, as near the head as possible, we find that the cone or pointed head has a greater surface than the spherical head, for one thing, and all surface in front of the perpendicular line presents head resistance.

I think the "air current" lines shown in Mr. Robinson's diagram a little misleading; perhaps they should be shown thus:—



Taking Fig. 1, we take first the current meeting the point; it is divided by the point, and travels along the surface of the cone.

The body is still meeting more air currents at all parts of the surface of the cone; but they are added to those which are divided by the point, addition taking place *on* the surface of the cone, the whole making great head resistance.

Now take Fig. 2, the body travels forward; there is no point, therefore no division of air currents in the same way as in Fig. 1.

The air is smashed, as it were, by the foremost part of the spherical head, sprayed in all directions, breaking and partly carrying off currents which would meet the other part of surface of the head, therefore making less head resistance.

The same applies to struts made in these sections.

Referring to bullets mentioned by Mr. Fergusson (1684), I do not think they can be compared to stream-line bodies as, I believe, they spin as they travel through the air, and are designed to *enter* a denser element at the end of their journey.

With regard to Messrs. F. Robinson and Kellers' (1685) opinion of a battleship's bow, we must take into consideration that water is a denser element than air, and in this case is required to follow the line of the bow, as the air follows the line of the cone in Fig. 1, the difference being that the battleship's element, water, is on the *bottom side only*, and by being made to follow the line of the bow, gives stability to the ship when in motion.

The pin is another instance of the density of elements; it is designed to enter a denser element than water.

It remains with the density of, roughly, the three elements, and may be formulated as follows:—

	Solids.	Liquids.	Air.
Bodies enter	easy	easier	easiest
Heads to give least resistance	very pointed	medium pointed	blunt

If the theory of the point is correct, why not right-about-face the stream-line body and have a good long point?

Red Hill. W. H. NORTON.

"Stability."

[1707] May I ask your permission to make a few remarks on your editorial notes in this week's issue? I read your comments on the trend of research into the question of "stability" with very great interest, and the chief impression I gained was that it was taken for granted that all experiment must have for its basis the present *principle* of construction, by which I mean that the accumulated knowledge gleaned from results obtained by actual flying on the present types of mono- and biplanes must be the direction in which we must look for perfection towards safety; and that this research will have to demonstrate which is the correct construction of wing; that is, whether these should be straight, arched, turned up or turned down, &c., &c., and having proved which is the best method of construction for all general purposes, to improve steadily along that line. If I have interpreted your meaning correctly, I would like to point out what seems to me to be an impression that is taken too much for granted, and that is, that the present general principle of construction is the correct one, and that the correctness of following the bird-wing method of construction cannot be gainsaid.

Well, Sir, I am inclined to dispute that, and I hold that opinion not as the result of mathematical theorising, but on account of results obtained in another direction by actual experiment.

I claim no technical knowledge of the science, but, be the source of my knowledge what it will, I think I may legitimately claim this: That I have a model of an aeroplane that is constructed upon a totally different principle to any I have ever heard of, and is certainly totally unlike any that are at present in general use. Theoretically lateral tilt is foreign to its construction, and without, I believe, holding any cranky notions on the matter, I feel convinced that lateral tilt is impossible (balance is automatic). Now, the model is a very crude one. As regards workmanship, it is made of metal throughout, with the exception of elastic and propellers; weighing 11 ozs., with 12 yds. of ¼-in. strip, driving two 8-in. propellers; it has flown about 20 yds. on a superficial lifting area of approximately 60 sq. ins. (certainly much less than ½ a sq. ft.)

Now, Sir, this is no gyroscopic or helicoptic arrangement, but just a very simple method of construction, based on an idea I held long before flying was considered a practical possibility. As regards strength of construction, I should imagine that its possibilities are far in advance of any of the, shall we say, comparatively flimsy machines in present use, and when I discussed the matter with one of the first authorities in this country, he, without committing himself, said it certainly should be tried.

My model was built without any mathematical calculations, other than by the eye, of discovering its centre of gravity, and it flew without rudders or guides. The flight was of course short, but, considering weight *versus* power, size of propellers and its very small lifting surfaces, I believe it is exceptional.

Now, it seems to me, here is a case for your National Physical Laboratory, and I agree with you when you say, "After considering every elementary situation in which many factors complicating the issue in respect to a practical machine are ignored," and I opine, if that were done, one of the first of these factors to be ignored will be the *trivial* detail in the construction of the wing, but we want a N.P.L. that is a *National* P.L., and one that is *prepared in confidence* to give advice free to people with ideas. I cannot afford to protect (as it should be protected) my idea, and until it is properly protected, I do not see how it can be thoroughly tested, unless there be some such institution that can treat confidentially with a man who expects to get something tangible out of his ideas.

If my idea be sound, the present method is absolutely unsound. There can be very little doubt of that.

Thames Ditton. A. R. PEARSON.

"Venus or the Moon?"

[1708] In the last issue of FLIGHT, I see under a very fine photo of Mr. Pixton, flying in Italy at sunset, the remark that in the left-hand corner the rising full moon could be seen. The sun at the present time sets about W.S.W., and in Italy would be a few points more west, and as the light spot supposed to represent the moon *rising* is approximately S.W., it cannot really be the moon, which rises usually in the east, and not in the west. It is much more probable that it is Venus, which at present is a very bright evening star, and is visible in the south-west at sunset, and although not quite the size of the dot in the photo, it would appear so through slight halation, in the photo.

Believe me, with best wishes for the continued success of your paper,

Wembley. DENIS S. WRIGHT.

Another Mystery Aircraft.

YET again the throb of an aerial motor and the whirr of a propeller has been heard during the hours when most worthy citizens are abed. This time the mysterious aircraft was heard at Dover at 5 a.m. on the 5th inst., but it was not unlikely an aviator from a flying ground, not a hundred miles from Dover, out for a *very* early spin. No doubt if aviation progresses as rapidly in the future as it has done in the past it will not be long before episodes such as this will be deemed just in the day's or night's events.

Capt. Penfold's Balloon Trip.

WITH regard to the balloon trip across London and descent by parachute by Capt. Penfold, referred to in our last issue, we learn from Messrs. Aeros, Ltd., in whose hands Messrs. Sandow left the whole of the organisation, that they completed the arrangements for the trip within two days of the receipt of order. The cinematograph film obtained by Messrs. Gaumont is now being shown in various places in London.

A New Wire Strainer.

IN the accompanying sketch is illustrated a strong and compact wire strainer, which, under the name "Dwarf," is now being sold in this country by Mr. Aug. E. Menuge, of Victoria Works, Englefield Green, Surrey. These strainers are exceptionally well

made, and we understand that after lengthy tests by the leading French manufacturers they have been found eminently satisfactory. It is claimed that they will stand a greater strain than any other similar fitting upon the market.

A New Telephone Number.

MESSRS. BURROUGHS WELLCOME and Co., of Tabloid fame, announce a simplification in their telephone number, which will be, in future, Six Thousand City.

PUBLICATION RECEIVED.

Catalogue.

Aviation Accessories and General Trade Requirements, 1913. Aeros, Ltd., 39, St. James's Street, Piccadilly, W.

Aeronautical Patents Published.

Applied for in 1911.

Published January 9th, 1913.

28,266. J. STEPHEN. Flying machines.
28,704. C. D. BURNEY AND BRITISH AND COLONIAL AEROPLANE CO., LTD. Aeronautical apparatus.

Applied for in 1912.

Published January 9th, 1913.

8,656. W. SKERRY. Self-acting descending flap for aeroplanes.

FLIGHT.

44, ST. MARTIN'S LANE, LONDON, W.C.

Telegraphic address: Truditur, London. Telephone: 1828 Gerrard.

SUBSCRIPTION RATES.

FLIGHT *will be forwarded, post free, at the following rates:*—

UNITED KINGDOM.	s.	d.	ABROAD.	s.	d.
3 Months, Post Free ...	3	9	3 Months, Post Free ...	5	0
6 ,, ,, ...	7	6	6 ,, ,, ...	10	0
12 ,, ,, ...	15	0	12 ,, ,, ...	20	0

Cheques and Post Office Orders should be made payable to the Proprietors of FLIGHT, 44, St. Martin's Lane, W.C., *and crossed London County and Westminster Bank, otherwise no responsibility will be accepted.*